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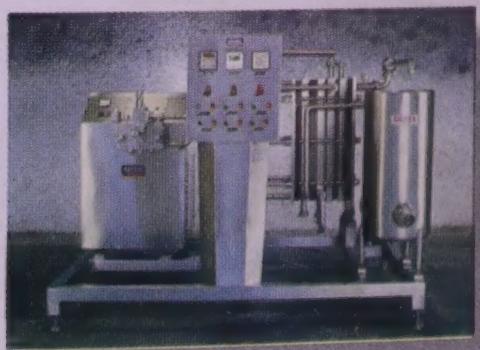
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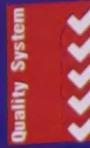
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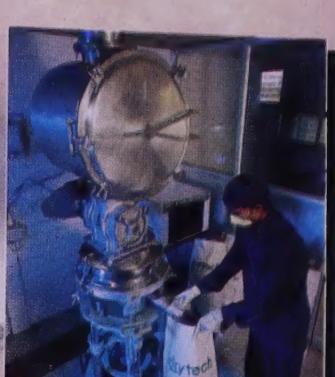
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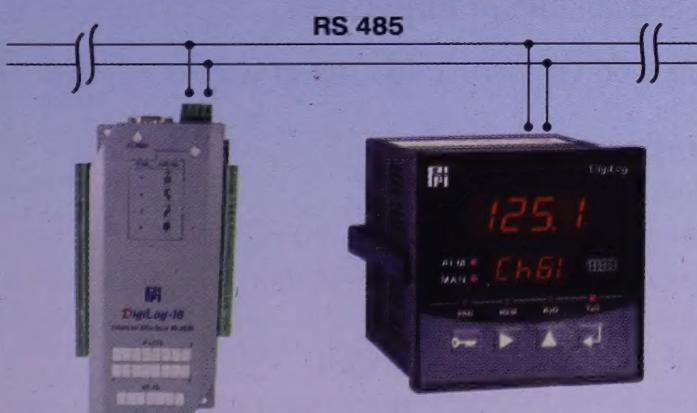
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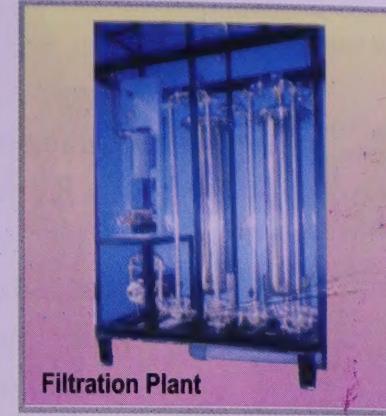


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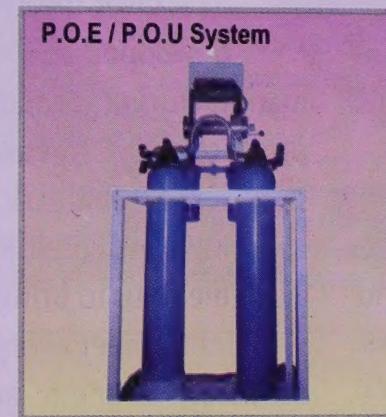
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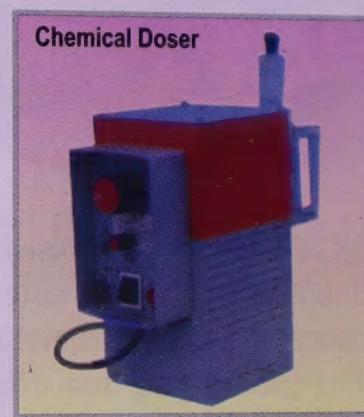
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Blanching of Fruits and Vegetables

by
* S. Iqbal Ali and Ralph P. Cavalieri

Abstract:

Blanching is an essential operation in the field of food preservation and has been carried out for centuries. It is a thermal operation done before freezing, dehydration or canning to preserve the color, texture and flavor of the fruits, vegetables and meat products. Food processors are missing the broader understanding of this important operation resulting in huge economic losses in term of energy losses, deterioration in quality, decreased shelf-life and enhanced discharge of effluents requiring waste water pollution treatment. Food is thermally heated to deactivate the enzymes which could result in imparting certain undesirable properties to the food during the storage. In this article, authors have tried to explain the essentials of this preparatory thermal operation as well as the design of equipment involved. With WTO in operation, India stands a good chance to penetrate in the international market of fruits, vegetables and animal products. For all this to happen, the Food Processing Industry requires retooling and blanching as the first step in this direction.

1.0 Introduction:

The preservation of agricultural produce using various methods for long term consumption has been carried out for years. Storage ranging from a few weeks to many months is done by freezing, canning or dehydration of fruits and vegetables. Blanching is an important thermal operation for preparing the commodities for preservation of any type. In this article, an attempt is being made to discuss various issues related to blanching. Broader understanding of the blanching process could make this operation more efficient, conserve energy, generate less effluent and improve product quality. In order to achieve this, a critical evaluation of blanching requirements, nature of product, desired product qualities, type of equipment, waste disposal costs and energy prices is necessary.

It is known that blanching is done primarily to inactivate the naturally occurring enzymes inside the fruits or vegetables. Freshly harvested vegetables in case frozen without pretreatment change their appearance, odor or taste with time and become less acceptable to the consumer. The process of blanching involves the treatment of products with the means of

moderate heat usually boiling water or steam. Blanching operation depends upon the nature of material, time and temperature of heating, desired properties in the food and source of heat. Blanching as a pretreatment nevertheless is done differently for canning, freezing and dehydration.

Blanching has different purposes for canning, freezing and drying. As a pretreatment for canning it has objectives such as (1) the removal of gases trapped inside tissues; (2) the shrinkage of the biological material so that adequate and reproducible fills can be made in the metallic cans and (3) the heating of the material prior to filling so that vacuum will be obtained inside the cans after thermal processing. Another advantage of blanching as a pretreatment in the canning industry is that it reduces buckling of cans after thermal processing by minimizing internal stresses. Inactivation of enzymes takes place during retorting operation so blanching for canning could be much different than one for freezing preservation.

Contrary to the above, the inactivation of natural enzymes present in the produce by the pretreatment operation is very important in the freezing process because no final sterilization is done prior to freezing and storage. The main objective of blanching as pretreatment for freezing is to prevent undesirable deterioration in flavor, odor and color on the part of enzymes. So as a part of the preparation for freezing preservation besides enzyme deactivation, blanching is necessary to shrink the tissue material to conserve the space in packaging, storage and transportation. Besides heating, blanching displaces the trapped air in between the biological tissues which result in enhanced heat transfer and reduce the freezing time. Absence of oxygen in contact with the sensitive surface of the vegetables further reduces the degradation in the produce quality by limiting the aerobic biochemical reaction.

Blanching is necessary to inactivate the enzymes in the material as a part of the preparation for dehydration in order to retain colour, flavor and taste characteristics during dehydration operation as well as storage. Besides the reasons discussed above some other benefits can also be derived from the blanching in the food processing operation (Richtee, 1995). These secondary purposes could be (1) reduction in the microbial population such as moulds, bacteria, cells etc on the surface of the fruit/vegetable; (2) slowing down the biochemical reaction during storage due to elimination of air; (3) reduction in packaging space due to the shrinkage of fruit/vegetable tissues resulting in smaller storage and shipping space. Blanching in some cases can preserve, stabilize or even improve texture,

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color or flavor qualities in the product. It can also facilitate further processing of the vegetable/fruit in some cases such as peeling and cleaning.

The early work on blanching was done by Joslyn and Cruess (1929). They discovered that mere storage of vegetables at low temperature did not prevent it from developing off-flavor, -odor and -color in the frozen food. Later Barker (1930) reported similar observation on the importance of blanching and noted that mere freezing up to -18°C temperature was not sufficient to retain color, flavor and odor in the product. Slowly people realized that partial cooking prior to freezing maintains many desirable properties even after storage of several months. Adam *et. al.* (1942) recognized the positive effect of this pretreatment in canning process. Blanching thus became an universally acceptable pretreatment operation prior to freezing, canning and dehydration with the purpose of inactivation of enzymes present in the tissues and imparting some other desirable characteristics in the vegetable/fruit as described above.

Notwithstanding the demand of enzyme deactivation, over-blanching could damage the texture and nutritional properties of plant tissue. It may also result in excessive energy application, generation of a large effluent quantity with high **BOD** and **COD** and deterioration of product quality. All this may make food production operation uneconomical. Long blanching times or excessively high temperatures may leach out valuable components especially water soluble vitamins and minerals which would reduce the nutritional value of the final product. In all cases over-blanching should be avoided to achieve optimum product quality and keep plant operation economical and competitive. Nevertheless, under-blanching of the product is also undesirable as it would result in inferior quality material during storage. Lastly, excessive blanching may result in a larger pool of wastewater with high concentration of BOD and COD costing the processor in effluent treatment.

2.0 Blanching Equipment

The standard blancher is made of stainless steel conforming to food grade specifications. There are many blancher designs available in the industry. Blanching equipment commonly used in the food processing industry can be classified on the basis of type of heating medium used namely hot water type, steam heated type or microwave heated.

2.1 Hot Water and Steam Type

Hot water type blanchers traditionally in use consist of a cylindrical drum. The upper-half of the cylindrical outer casing is hinged and can be opened by turning a handle. This drum contains a central shaft attached with perforated fins tightly fitting to the cylinder. Material moves inside the outer casing containing hot water by rotation of perforated fins. Food movement is regulated by an electric motor and variable gear system. Hot water is prepared by directly injecting steam in the blancher. A variable speed gear provides variation in blanching time. Blanchers are generally supplied in standard drum. Similar to any other thermal food processing equipment, a blancher has special provision to prevent the growth of bacteria by providing temperatures above 70°C for all parts in contact with the food and with provision for quick cleaning. Drain and overflow valves of special design are fitted to maintain hygienic environment.

Generally steam blanching has been found advantageous over the hot water blanching in the industry. Ritchie (1995) has reported that the processors blanching 3 minutes for a product with the hot water, needed merely 26 seconds with the steam. Other advantages of steam blanching over hot water are higher throughput, lesser product loss in the effluents, smaller effluent volume with lower total BOD and smaller loss of nutrients from the product. Steam blanching results in less found in hot water (Ritchie, 1995). Furthermore, effluents from hot water blanching demand 30 times more oxygen to biodegrade the leached material, than the effluents from the

steam blanching. Steam blanching therefore reduces effluent disposal cost, conserves energy, enhances quality of the product and makes whole food processing operation more competitive.

Steam blanchers in general contain a steam chamber through which food passes on a conveyor belt. The chambers contain nearly saturated steam which condenses on the food for the rapid heating. Condensing steam increases the rate of heat transfer between the medium and the product. Air and other non-condensable gases are purged out from the steam chamber before starting the operation. Food is heated at the constant temperature in the chamber by the condensing steam. A predetermined heating time is set by adjusting speed of the conveyor belt through the cooking chamber.

Some designers use plastic conveyor belts to conserve heat while others go for traditional metallic. Plastic conveyor belt and its mechanism results in lighter weights requiring less power to make it run. The constant temperature inside the chamber achieved by condensing steam makes automated controls simple and effective in reproducing cooking conditions for reliable blanching. Infiltration of air or other non-condensable gases could reduce the heating ability of steam significantly so a positive pressure just above the ambient is necessarily maintained inside to prevent their infiltration. All the exterior surfaces are adequately insulated to prevent heat loss.

Designs adopted by manufacturers generally incorporate features such as high throughput, low energy losses, smaller lengths, high product recovery, small effluent volumes and easy adaptability to various vegetable/fruit inputs. Volume of the heating chamber is determined on the basis of system's dynamics for steam and condensate to minimize fluctuation. All efforts are made to exclude infiltration of air from the outside or leakage of steam to the atmosphere by providing seals. Cooking chambers with high insulation and heat capacity provide temperature stability. It is of utmost importance that all designs have provision for the effective and quick cleaning to prevent microbial contamination.

Most steam blanchers possibly incorporate the above features. Modern designs of steam cookers or blanchers are flexible consisting of in-feed modular, center modular and discharge modular. By providing variable length, middle or cooking modular, production throughputs can be changed by varying the passage length resulting in higher retention times. Cooking medium of low pressure steam is normally available in most of the plants. Steam condenses on the food and heats the food consequently deactivating the enzymes. Inlet and outlet zones have special valves to prevent steam leakage to the environment. Thermal success of the unit depends upon the quality of inlet and exit steam traps at both ends of the equipment. Food enters on the one end, moves over a belt conveyor whose speed can be adjusted to control the blanching time and exits from the other end.

The design of steam blancher/cooker could differ namely on two accounts; (1) steam chamber with a fixed roof which can be dismantled by opening screws for cleaning purposes versus one in which steam chamber is covered by a hydraulically controlled hood whose position above the food can be regulated; (2) Second difference is in their mechanism of heating. Some heat its material under forced steam re-circulation conditions resulting in much higher heat transfer rate compared to the others which use natural convection for the heating.

2.2 IQB Type

IQB (Individual Quick Blanch) although similar to conventional steam blanching, was developed to significantly reduce both volume and BOD strength of the blancher effluent without leaching of nutrients and loss of texture of processed vegetables (Lazar *et. al.* 1971; Bamben, 1979). IQB system divides total blanching time into heating and holding. Steam is injected in the first section and heating takes place by condensation of steam similar to the conventional steam blanching. In heating zone, vegetable particles form one layer deep loading rather than the much heavier normally used in conventional type steam

lanching. Recommended vegetable loading in conventional type and IQB type steam blanching are 15.0 and 4.9 Kg/m² respectively. Here, maximum heating occurs by the natural condensation of steam on the completely exposed surface of the particles. Temperature of the vegetables is raised to approximately 88° C before unloading them on the conveyor belt of the holding zone.

Holding zone is held at constant temperature by insulating adiabatic system and this chamber does not receive any outside heat. Vegetable loading in the holding zone conveyor belt is approximately ten fold higher to 49 kg/m². Actual deactivation of enzymes takes place in the holding chamber. Food conveyors move at different speed for both sections; lower in the holding section thus providing higher food bed thickness. IQB studies showed effluent reduction, lower BOD and solids in the effluent, higher product yield as well as quality over the conventional processes. Heating in IQB method is mainly by natural condensation of the steam giving lower heat transfer.

2.3 Hot Gas and Fluidized Bed Type

Some new methods have been proposed by the investigators in order to overcome disadvantages such as leaching out of vitamins and minerals, generation of high BOD effluents, in steam and hot water blanching. These methods are fluidized bed blanching (Mitchell *et. al.* 1968), IQB (Lazar *et. al.* 1971) and continuous hot-gas blanching (Ralls *et. al.*, 1972 & 1973). Ralls *et.al.* (1972) evaluated microwave, hot gas, steam and hot-water blanching methods to reduce the effluents and found hot-gas blanching promising. There are several advantages in hot-gas and fluidized bed blanching. However, much work needs to be carried out before commercialization of these new blanching methods.

Hot gas blanching offers almost complete elimination of wastewater effluents reducing the cost of waste disposal. In this blancher, the washed vegetables are conveyed through a heated chamber. The combustion products of natural gas are forced through the vegetable bed by a blower. Small quantity of steam is injected in the combustion gas mixture at outlet of the blower to control dehydration of the vegetables. A part of the combustion gas mixture is released through vent pipes and remainder gas mixture is re-circulated through blower. Results from many investigations have shown higher nutritional and mineral properties of the product without any significant difference in the texture, flavor or appearance attributes of the hot gas blanched product over conventionally blanched product. Ralls *et al.* tested hot gas blanching on spinach, snap beans, peas, corn on the cob and beets.

In fluidized bed blanching, contrary to conventional fixed bed, a bed of vegetable particles is subjected to an upward gas of sufficient velocity to cause the bed to behave as a fluid. Heating gas flows through the interstitial spacing between the particles. High gas speeds around each vegetable particles, complete exposed surface and turbulence in the solid gas mixture gave very high heat transfer rates in comparison to the conventional steam blanching, resulting in shorter heating times. Steam-air mixture is used for heating as well as for fluidization. Presence of steam reduces dehydration or drying of the material. Fluidized bed blanching offers several advantages over the conventional blanching for some products such as spinach and peas. Shorter heating times and negligible wastewater generation are some of the advantages in developing fluidized bed blanching.

2.4 Microwave Type

Among non-conventional type blanching methods such as fluidized bed, hot gas and microwave type, the latter offers most commercial potential for the food processing industry. Besides substantial reduction in heating time, the biggest advantage microwave blanching offers to the users is in nearly complete elimination of wastewater effluents (Ralls and Mercer 1979; Bomben 1979). The microwave energy caused much rapid inactivation of enzymes then did boiling water without affecting

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the texture. In tubers with 2.27 cm mean radius, boiling water inactivated the peroxidase in 13 minutes while microwave heating could perform it in merely 4.7 minutes. Dietrich *et. al.* (1970) suggests a combination blanching i.e. microwave-steam blanching or microwave-hot water to effectively inactivate the peroxidase enzyme for the Brussels Sprouts for frozen storage.

Microwave heating offers several advantages over the conventional steam or hot water blanching. In convention heating by steam or hot water, heat transfer takes place by the temperature gradients across particle surface and the core of the food while microwave heating offers advantage of deep penetration power resulting in rapid heating inside the particles. As most of the vegetables contain overwhelming quantity of water, it absorbs microwave energy readily. Steam is added in microwave heating to attain uniform temperature of the vegetables (Bomben 1979). Prohibitive costs of microwave energy, design for uniform heating and impact on texture, flavor and appearance of the product are the main issues to be resolved before microwave blanching can be used commercially in the food industry.

The quality of carrot and cauliflower blanched by the conventional as well as microwave method was not significantly different while the texture of Zucchini blanched by microwave was more limp. Microwave heating thus can not be adopted universally to all vegetables for the commercial or household blanching applications. Microwave blanching and its effects on the product quality need complete investigation before it can be commercially used.

2.5 Other Blanchers

In order to conserve energy and reduce blanching time, several other designs have been presented by various investigators. Bomben (1979) presents a concept of Spiral Blanched-Cooler in which food moves over a spiral vibratory belt. The design both reduces the effluent (hydraulic load as well as BOD) and increases thermal efficiency. Here, effluents leaving the blancher are cooled by an air fan for latter spraying on the vegetable pile

as they are cooled reducing the effluent from cooling. Usage of effluent water for cooling of blanched vegetables reduces leaching of valuable minerals and nutrients. Similar to the IQB blancher, heating and holding chambers are separated in the blancher, heating and holding chambers are separated in the blancher. Being vertical flow type unit using spiral conveyor belt, significant energy conservation is achieved as the incoming vegetables themselves become a seal and thus prevent the large steam loss.

Others have proposed a convective heating design to reduce the effluents. Some even suggest a two stage blanching strategy: low temperature-long time followed by high temperature-short time (LT/LT/HTST) opposed to the conventional hot water or steam blanching of HTST. HTST blanching could cause poor retention in firmness of the vegetables. Two stage or stepwise blanching, involves initial low temperature-long time (LT/LT) heat treatment at 50-70° C for 20-30 minutes followed by a conventional HTST blanch. Further investigation is needed as LT/LT/HTST concept offers some heat conservation possibility in blanching.

3.0 Blancher Selection

Blanchers are classified into two major categories: (1) hot water, steam heated or conventional type and (2) Non-conventional type including fluidized bed, hot gas or microwave heated. Although non-conventional type blanching sometimes is advantageous due to generation of insignificant effluents but none among them has been developed to commercial exploitation in food industry. Microwave blanching, nevertheless, has the potential to make substantial impact on industrial applications but more research is needed to harness its full potential.

All commercial blancher designs in the food industry are based upon conventional heating either by hot water or low pressure near saturated steam. Suitability to the product, heating efficiency, water consumption, quantity and quality of waste water, weight loss or gain in the product, product quality and leaching of water soluble nutrients are some main parameters to be taken into consideration when a selection of a suitable blancher is made. Some other features being incorporated in the newer designs are improved insulation to conserve heat, compact size, ease in relocation, flexibility in control of operation and smooth flow of material on the conveyor belt. The following essential features over and above the demand for the capacity throughput and blanching temperature in a good blanching technique can be listed:

1. A uniform heat distribution to the particles across the bed.
2. A uniform blanching time or equal residence time to all food particles.
3. At least minimum inactivation temperature reaching to each point in all the units of product. This is essential for complete inactivation of the enzyme.
4. Avoidance of hot and cold spots inside the blancher.
5. No damage to the product during the entire blanching, cooling and transportation process.
6. A high product yield and quality with minimum losses either by dehydration or leaching of the vegetables.
7. Low consumption of energy and water with minimum generation of waste effluents.
8. Quick and easy cleaning of the equipment with handy operation including easy moving of blancher from one location to another.
9. Three shifts full time continuous operation.
10. Compactness in design to save floor area.
11. The design must also provide a pleasant worker friendly

working environment free from noise, heat radiation, particulate and aerosols, odour and loss of steam and process water with foam and product flushing on the floor.

12. Ease in loading and discharge of the product with least labor usage. Product must not be harmed during movement through the blancher.

Forced circulation type units operate on higher food bed depth and offer larger throughput compared to IQB or ordinary steam blanchers. Knowledge of nature of vegetable and desire characteristics in the product is very important in selection of the blancher. For instance spinach as well as potato fries are always blanched by hot water due to heat transfer limitations of the former and product quality needs of the latter.

4.0 Conclusions

Although blanching of food products is a relatively old process it is still not understood well. Commercial methods use large volume of hot water or steam producing a large quantity of high BOD effluents besides losing valuable nutrients. Food processing industry is a major water pollution source. Proper selection of equipment and blanching operation could reduce the cost of energy as well as generation of waste-water resulting in substantial savings. Properly blanched fruits and vegetables containing higher level of essential vitamins and minerals could fetch better remunerative prices from the consumers. Better understanding of heat transfer and kinetics of enzyme deactivation in the blanching operation could reduce effluent generation significantly. This article makes merely an attempt to touch some of the issues involved in blanching.

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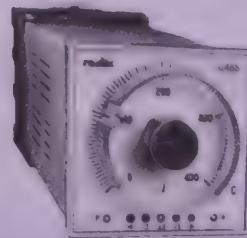
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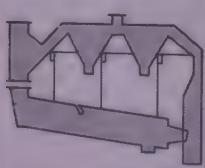
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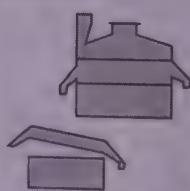
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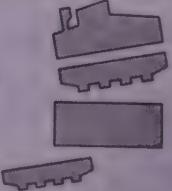
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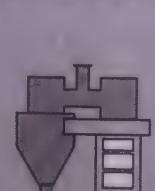
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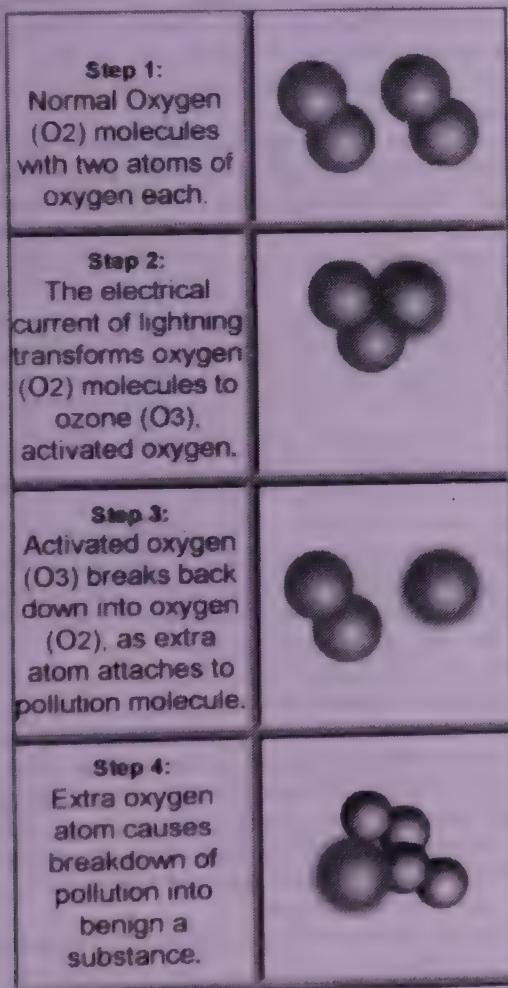
Use of Ozone for Fresh Foods, Processed Foods Prevents Disease and Enhances Shelf Life!

by
Kashyap Mehta

The reduction and control of food pathogens are essential on fresh food products like fish, fruits, meat, and vegetables from farm-to-kitchen. Spoilage organisms like bacteria, fungus, mold spores, and virus reduce the product shelf life. These spoilage organisms thrive and multiply faster at higher temperatures and high humidity. Many of these organisms will multiply even at lower temperatures during refrigeration. Most of the cross contamination occurs during storage.

By use of pesticides, there are hundreds of chemicals added to the foods consumed by us. Many organic and inorganic compounds are in drinking water, along with others added to the soil by growers. These synthetics cause adverse health effects to those who work with, retailing personnel and those who consume these foods. All chemicals used in what we eat and water treatment has a negative impact on human risk factors, as well as the environment. These chemicals cause severe personality changes, skin rashes, chronic cellular toxicity, cell damage, aging, cancer and other related illnesses.

If everyone from farm-to-kitchen utilized Ozone, (also referred to as activated oxygen, tri-atomic oxygen or O_3), the war on pathogens could end.



Ozone is a naturally occurring gas created by the force of corona discharge during lightning storms or by UV light from the Sun. Some of the Oxygen molecules break into single atoms. Ozone (O_3) is an allotrope of oxygen (O_2). It is 1.5

times as dense as oxygen and 12.5 times more soluble in water and leaves no residuals or byproducts except oxygen and a minimal amount of carbon dioxide and water. It can be manufactured from dry air or from oxygen by passing these gases through an electric field of high potential sufficient to generate a "corona" discharge between the electrodes. Ultra-violet light and shorter wavelength radiation also causes oxygen to undergo conversion to Ozone. Ozone is a more potent germicide than hypo chlorite acid by factors of 10 to 100 folds and disinfect 3125 times faster than chlorine.

Ozone is highly unstable and must be generated on site. The measure of an oxidizer and its ability to oxidize organic and inorganic material is its oxidation potential (measured in volts of electrical energy). Ozone's oxidation potential (-2.07V) is greater than that of hypochlorite acid (-1.49V) or chlorine (-1.36V), the latter agents being widely used in water treatment practice.

Oxidation potential indicates the degree of chemical transformation to be expected when using various oxidants. It gauges the ease with which a substance loses electrons and is converted to a higher state of oxidation. Theoretically the substance with the higher oxidation potential will oxidize the substance with the lower oxidation potential. The oxidation potentials of common oxidants and disinfectants associated with water and wastewater treatment are all of a lower oxidation potential than Ozone.

Organic compounds treated with a powerful oxidant as ozone will not always be converted totally to carbon dioxide and water, especially under abnormal industrial wastewater conditions. Therefore, no other commonly employed and less powerful water treatment oxidant (i.e. chlorine, bromine, chlorine dioxide, etc.), all of which have lower oxidation potentials than ozone, will oxidize an organic material completely to carbon dioxide and water if ozone will not.

Is Ozone Safe?

Ozone is very safe – In over 100 years of use, there has never been a fatal accident. While chlorine forms thousands of extremely toxic by-products, ozone forms virtually none. These and other properties make Ozone an Ideal Purification and Disinfecting agent. Ozone is generated electrically and therefore adds no chemicals into the treated water.

Ozone is the most effective natural bactericide of all the disinfecting agents without dispute through the scientific community. Activated oxygen is considered by most to be the best available technology and a much better alternative than using chlorine for water purification.

Ozone is now being used in food processing or storage of perishables as an anti-microbial agent or as a food processing aid. The use of Ozone will benefit all perishables, all phases of food processing or preparation areas and packing areas. It will help prevent disease and enhance the quality of the working environment at the same time. A cleaner breathing environment raises worker's productivity with fewer accidents. The presence of ozone in the packing area eliminates the bacteria and this increases shelf life drastically. A reputed cake manufacturer used Ozone in the packing area and the results were dramatic, increase in shelf life by nearly 50%.

Ozone is the safest and most natural purification and disinfecting agent in use today. It is the strongest and most ideal, germicide, sanitizer, sterilizer and vermicide agent, anti-microbial, bactericide, fungicide, and deodorizer, detoxifying agent.

Spoilage organisms and pathogens multiply which causes decay and sickness and this can be taken care of by use of Ozone. The chemical reaction and processing of plant cells, in the presence of light, changes formaldehyde into plant sugar. The granules produced, starches (sugar) are called plant quantasomes, which are present within the chromosome, and are postulated to be the units of photosynthesis. Photosynthesis begins with plant quantasomes and sunlight.

Working Environment

Organic or bacterial slime grows on refrigerated evaporator coils, drain pans and at times it plugs up the condensate drain lines especially in cooler boxes. As the air travels through the coil to be cooled it picks up the microorganisms and blows it across the room contaminating any unwrapped product. When the coils are neglected and not cleaned on a regular basis, the slime can restrict the flow of air to almost nothing. Those working in these areas are breathing the stale contaminated air and suffer the consequences. Ozone has the capability of destroying bacterial slime and can turn the old stale air into cleaner air.

In low concentrations, it is generally a stronger fungicide than a bactericide. In low concentrations it can prevent the growth of mold on the surfaces of cooler walls and fruits when the temperature is below 50 degrees. At lower temperatures, the microbe's metabolism is reduced and its effect is more beneficial. The microbial effect of present mold spores is increased with higher concentrations and higher humidity. Good air circulation also raises the microbial effect and sterilization of the air.

Benefits and Effects on Fruits and Vegetables

Stored fruits and vegetables absorb gases from the ripening and decay of others. The odours from ethylene gas, packing materials, mold spores and other contaminates contribute to rapid ripening that affects the taste. The process of respiration is speeded up along with faster ripening when more off gases are produced.

Ozone will oxidize the metabolic products and neutralize the odours generated during the ripening stage in storage. This helps to preserve and almost doubles the shelf life of fresh produce, and it enhances the taste of each by retaining their own original flavour. Florists and nurseries also experience the benefits of added shelf life and healthier plants using Ozone. The extension of shelf life and less shrinkage adds tremendous savings with higher profits.

Ozone enhances the taste of most perishables by oxidizing pesticides and by neutralizing ammonia and ethylene gases produced by ripening or decay. The reduction of ethylene gas increases the shelf life and reduces shrinkage. It changes the chemical complex molecular structure back to its safe and original basic elements. Its use does not leave any toxic by-products or residues, does not affect healthy cells or alter its chemistry, and is non-carcinogenic. Ozone always reverts back to its original form "Oxygen".

The shelf life will vary on perishable foods when they are subjected to O₃ with various benefits between them. Factors like age, crispness, quality, humidity, temperature, the condition on receiving, and the reduction of pathogens during ozonation will determine the extended shelf life of each different type. Positive effects will show at low and constant levels between 0.05 PPM and 0.1 PPM and it allows workers to enter the storage area and carry out their work comfortably.

Ozone will be constantly consumed and absorbed during the oxidation process. The effectiveness is influenced (lowered) due to the presence of steam or 100 percent humidity of swelling in order to be attacked. When the humidity level is below 50 percent, the efficiency of it slows as a bacterial medium.

It is highly recommended that all growers and processors use ozonated water to wash fruits and vegetables instead

of chlorine. Applications of it can be applied safely to process water for hydro-cooler systems, bin, dump and dry tanks, flumes, spray wash systems, wastewater treatment processing and storage areas at an affordable cost. Making full use of ozonated water will increase production.

Some Benefits and Effects on Meats and Fish

It is efficient on fresh meat as low as 0.04 PPM to retard and control the growth of microorganisms. Higher levels of 0.1 PPM have been used for curing or aging beef. The higher level tends to oxidize fats, and actions of the digestive enzymes soften and slacken muscles and connective tissue that makes it tender. This process takes about 44 hours with O₃ and about 20 days without it.

Through a series of experiments it is found that significant levels of microbial contamination sets in after 7 days on beef, lamb, pork, chicken, and rabbit stored in a normal atmosphere. The same levels were reached on meat when exposed in an ozonated atmosphere only after 14 days under identical conditions. Shelf life can be increased by 30 to 40% in an ozonated atmosphere if the meat has low bacterial counts to start with.

Frozen Ozonated water is used for storage in fishing boats while at sea. Ozonated water is used for washing during processing and air applications when in storage. Fishing boats in Canada are able to stay out for about 14 days before returning to port by using it in the storage water. It can extend the shelf life of fish in a retail case for 1 to 3 extra days.

Food-Borne Illnesses Could be Eliminated

Extensive use of ozone from farm-to-table, meat and fresh produce prep areas in markets and restaurants could drastically cut down illnesses caused by bacteria, parasites, and viruses. According to a report from WHO, 30 percent illnesses are caused by bacteria, 3 percent by parasites, and 67 percent by viruses.

Viruses enter the body through the mouth via food, water, or other people. Once established they can cause two types of infections. They can adhere to the intestinal track and cause viral gastroenteritis (stomach flu) or to the liver causing viral hepatitis. The main viruses associated with gastroenteritis are *adenovirus*, *astrovirus*, *calicivirus*, *Norwalk virus*, and *rotavirus*. *Rotavirus* kills an estimated 600,000 children globally each year and 55,000 children are hospitalized in the United States annually. The viruses associated with hepatitis that are food-borne are Hepatitis A and Hepatitis E viruses. Any food-borne illness can be life threatening especially to the young and elderly.

Ozone has the ability of saving hundreds of thousands of lives annually and millions from illness relating to contamination. Mistakes do happen in the handling and processing, and will always continue to happen. When mistakes are made, you are placing your business, your customers and your reputation in great jeopardy.

We should have the safest possible products delivered in the freshest condition to the consumer. That means that the water supply is the key in every step of the chain from farm-to-table. Safe water is the key to life. Without it, human life would cease to exist. With the world's increasing industrialization, water pollution is multiplying at an alarming rate. Safe water means-Water that is free of algae, bacteria, cysts, fluoride, herbicides, mold, pathogens, parasites, pesticides, yeast and viruses.

Safe food and water are needed for the health and future of any nation. A healthy nation is a strong nation. Ozone will make this happen. Compared to other alternatives, it is the safest.

Solution – available today

The threat of over population makes this a necessity that we have the safest possible products for our consumers. This

Contd. on Page 20

Studies on Quality Parameters of Soymilk

by

Shivanarain, Gyan P. Sharma, & P.K.Jaiswal

Abstract

No quality standards for Soya Milk have been prepared so far by any of the organizations. Therefore a study has been conducted on 52 samples of Soya milk for the evaluation of the quality.

On the basis of the study, 6-quality parameters have been considered for sweetened and unsweetened Soya milk.

Introduction

Soyabean has been considered a potentially important contributor to the dietary protein intake of human population. Nutritional aspects of Soya protein in human nutrition have been reviewed by a number of investigators¹⁻³. Studies⁴⁻⁷ has also been conducted on evaluation of protein quality of soyabean and biological utilization of Soya protein in different Soya products. In view of this, a variety of acceptable food preparations has been developed⁸⁻¹¹ from the soyabean to fit into the dietary pattern of the Indian population.

Among the Indian masses, apart from traditional Soya food products, various Soya foods like Soya milk, paneer, sauce, miso, Nattu, Soya protein concentrates as well as soya powder and soya infant milk food have become popular. The soyamilk has a great scope because of its extensive consumption among the adults and children who have got lactose intolerance for cow and buffalo milk. In most of the cities, the soyamilk plants has been set up to produce sweetened and unsweetened flavoured soya milk in small polythene bags. But no quality parameter for this product has been prescribed by any of the agency like, BIS, PFA Act, etc. However Literature reveals¹², that a few studies have been carried out for some soya products like soya paneer for the purpose of prescribing the standards of quality.

Hence, in view of prescribing its quality parameter, this study was conducted to suggest quality standard of soya milk.

Material and Methods

It was proposed to procure and analyze market samples of Soya milk using standard methodology¹³. Accordingly, 52 samples of Soya milk in packed conditions were procured from local markets and analyzed for the following quality parameters at Regional Agmark Laboratory, Mumbai and Central Agmark Laboratory, Nagpur.

1. Vegetable fat
2. Total solid
3. Protein
4. Sugar
5. Acidity such as oleic acid
6. Specific gravity or density

Result and Discussion

The analytical data was examined and the frequency distribution of different quality factors in different ranges and their percentage share in total and cumulative percentage is given in Table I to VII. Data reveals that vegetable fat for about 13 percent of samples was below 0.6 percent and for another about 87 percent of samples its value was 0.6 percent and above i.e. up to 2.0 percent.

In case of total solid for unsweetened Soya milk, it was found less than 5.0 percent in about 77 percent of samples, and for rest 23 percent of samples it was up to 8.0 percent.

But total solid for sweetened Soya milk is less than 12.0 percent in about 28 percent of samples and for 72 percent of samples; it was up to 16 percent.

Therefore, on the basis of data, a minimum of 3.0 percent of total solid on sugar free basis is suggested for soya milk.

Protein was analyzed by Kjeldhal method using factor 6.25. The data shows that the protein in about 33 percent of samples was below 1.6 percent and for rest of the samples its

value was up to 2.4 percent.

The incidence of sugar free samples was 23 percent. Among all the samples studied, It was observed in case of the sweetened variety that the sucrose content varied between 5.0 - 11.0 percent.

Acidity of the milk was calculated as oleic acid. For about 42 percent of samples, it was upto 0.5 percent and for another 46 percent of samples, its value was in the range 0.51 percent to 1.0 percent. For remaining 12 percent of samples the value was found above 1.0 percent.

Relative density was examined at 27.0°C. The data has shown that relative density for about 31.0 percent of samples varied in the range of 1.01 - 1.02 (for unsweetened soya milk) and for 69.0 percent of samples the value was in the range between 1.03 to 1.06 (for sweetened soya milk).

Microbiological tolerance

1. TVC (maximum) 5×10^4 /gm.
2. Yeast and mold maximum 10/gm.
3. Staphylococcus - Absent in 1/gm.
4. E.Coli - Absent in 1 gm.

Microbiological examination of the soya milk neutralized revealed that almost all the samples are well below the PFA limits of ready to eat food commodities in respect of Total Viable Count/gm which is in case of our study has been shown to be maximum of 8.4×10^4 . In case of yeast and moulds the count/gm varied 10 - 100.

Pathogen like *Staphylococcus* and *E.Coli* were found absent in all the samples studied.

Hence, based on the above results, following specification may be suggested for grading the quality of unsweetened and sweetened soya milk.

Definition: Soya milk means the product obtained by grinding the water soaked soybeans and straining, it may contain acceptable fruit flavour, sugar and colour.

Parameters	Types of Soya Milk	
	Unsweetened	Sweetened
1. Vegetable fat % by mass (not less than)	0.6	0.6
2. Total solid % by mass (not less than)	3.0	3.0*
* excluding sugar		
3. Protein % by mass (not less than)	1.5	1.0
4. Sugar % (sucrose) not more than	Nil	10.0
5. Acidity (as oleic acid%) (not more than)	1.0	1.0
6. Relative density at 27°C	1.01 - 1.02	1.03 - 1.06

Table - I : Vegetable fat %

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
0.1 - 0.5	7	13.5	13.5
0.6 - 1.0	28	53.8	67.3
1.1 - 1.5	10	19.2	86.5
1.6 - 2.0	7	13.5	100.0

TABLE - II Total solid % without sugar

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
1.1-3.0	6	11.54	11.54
3.1-5.0	34	65.38	76.92
5.6-8.0	12	23.08	100.00

TABLE - III Total solid % for Sweet and Soya milk

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
10.1-12.0	11	27.5	27.5
12.1-14.0	25	62.5	90.0
14.1-16.0	4	10.0	100.0

TABLE - IV Protein Content (%)

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
1.3-1.6	17	32.69	32.69
1.7-2.0	24	46.25	78.84
2.1-2.4	11	21.15	100.00

TABLE - V Sugar %

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
5.0-8.0	12	23.08	46.18
8.1-10.0	22	42.31	88.49
10.1-11.0	6	11.5	100.00

TABLE - VI Acidity as Oleic Acid%

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
0.1-0.50	22	42.31	42.31
0.51-1.0	24	46.12	88.46
1.01-1.15	6	11.54	100.00

TABLE - VII Relative Density for unsweetened and sweetened *

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
1.01-1.02	16	30.8	30.8
1.03-1.04*	8	15.4	46.2
1.05-1.06*	28	63.8	100.0

TABLE Total Viable Count

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
Upto Nil	2	10.5	10.5
10 ¹ -10 ²	11	57.9	68.4
10 ³ -10 ⁴	6	31.6	100.0
Total	19		

TABLE Yeast and Mould

Range of Parameter	No. of Samples	% Share in Total	Cumulative %
Upto Nil	16	84.2	84.2
10 ¹	2	10.5	94.7
10 ²	1	5.3	100.0
Total	19		

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Contd. from Page 18**Use of Ozone for Fresh Foods, Processed Foods Prevents ...**

will not only help the nation but will also increase our credibility in the International Market. The days are not far when our Laws will consider contaminated foods a conspiracy, an offence that will be dealt with strictly.

Savings and the benefits received by everyone in the food chain, far exceeds the low initial investment in switching over to Ozonation. The operational cost for the production of ozone is minimal compared to your other expenses. It can insure the safety and quality of all products.

Cross contamination happens very easily in processing and retail sales, even when strict Health Code Laws are enforced. It eliminates pathogens and contaminates in the air and water. Ozone is environmentally safe. There are no unfavorable consequences with its use except to the pollutants that dirty and contaminate the air we breathe, and what we eat. Full use will save on chemicals normally used for pathogen control and microbial control that wind up contaminating our air and water resources. The reduction of the chemicals used will not only enhance the environment but our well being as well.

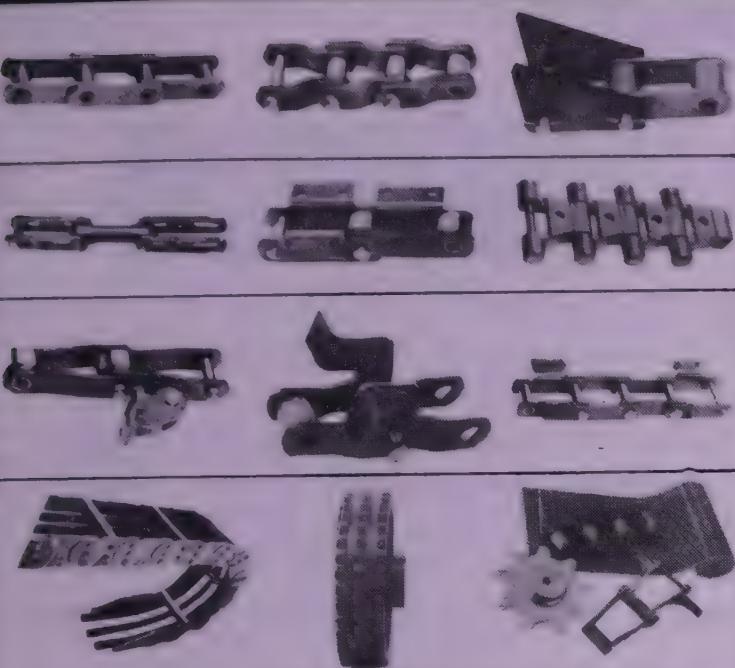
We are already seeing the bad effects on the ecosystem with the use of chemicals. When we keep feeding it with toxins, it will reproduce toxins. Most of all the chemicals used in growing crops, in the processing of foods, the drugs we use, the excess from waste treatment plants eventually winds up in the ocean. From the streams to the lakes, from rivers to the ocean, marine life, animals and birds are dying. If we want to get ourselves back in balance, we have to get nature back in balance. We feed on nature and depend on it for our survival.

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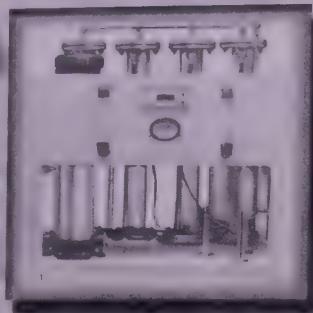
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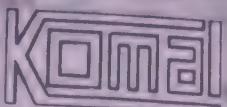
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Effect of Packaging and Storage on Quality of Pomegranate Arils.

by
P. B. Pathan, L. R. Khot and P. A. Unde*

Abstract

The pomegranate arils were stored using different storage methods and packaging materials. The polyethylene of 100, 200 and 300 gauge was used as packaging material. The packed samples were stored in deep freeze (-15°C), freeze (4°C) and at room temperature (27°C). The results of study showed that the weight loss was maximum in case of unpacked as compared with packed samples. The weight loss in case of deep freeze, freeze and at room temperature varied between 0.6 to 1.1, 0.2 to 2.2 and 2.0 to 9.2 %, respectively. The shelf life of arils was found maximum in deep freeze (54 days) followed by freeze (15 days) compared with storage at room temperature (4 days). The fresh pink colour and firmness of frozen arils was observed even after 54 days of storage at -15°C.

Introduction

The purpose of storage of fruits is to avoid market glut and help in stabilizing market prices and increase the scope for expansion of area and production of pomegranate fruit in particular and fruit industry in general. The pomegranate is commercially grown for its acid sweet fruit mainly used for dessert. The fruit is reported to be rich in mineral matter, protein and phosphorus content. The pomegranate fruit is consumed in processed forms such as juice, jelly, syrups, concentrates and anardana. The fruit juice, jelly, ferments may be used for the production of wines. Tannin occurs in fruit rind (upto 26% in dried rind). The juice is used for the preparation of medicines that cure dyspepsia, (Darade, 1995). Pomegranate arils are extracted manually. However, power operated pomegranate seed extractors are available for commercial processing of pomegranate fruits. The pomegranate arils could be used for table purpose, juice making and preparation of beverages. The utilization of pomegranate arils in food industry needs proper storage of the arils. In view of this, the experiments were conducted to study the effect of storage method on quality of pomegranate arils.

Materials and Methods

The experimental work plan of the study is given in Fig.1. Fresh fully matured pomegranate fruits (var. Ganesh) were selected for the experiment. The pomegranate arils (seeds) were extracted manually. The arils were packed in polyethylene containers of 100, 200 and 300 gauges prior to storage. The packed samples were stored at room and low temperature storages. The low temperature was maintained in the freeze (4±0.5°C) and deep freeze (-15±0.5°C). The samples stored without packaging in all storage methods were taken as control. The stored arils were assessed for its quality i.e. weight loss T.S.S, colour and softness index. The shelf life of frozen arils (stored in deep freeze) was compared with other methods of storage.

Weight Loss

Weight Loss was determined by weighing the material during storage at the interval of 1, 3 and 6 days in case of storage at room temperature, freeze and deep freeze, respectively. The weight loss was calculated in (percent) using eq (1)

$$\text{Weight Loss (\%)} = \frac{W_1 - W_2 \times 100}{W_1} \quad (1)$$

Where, W_1 = Weight of prepared material before storage, g.

W_2 = Weight of stored material after storage, g.

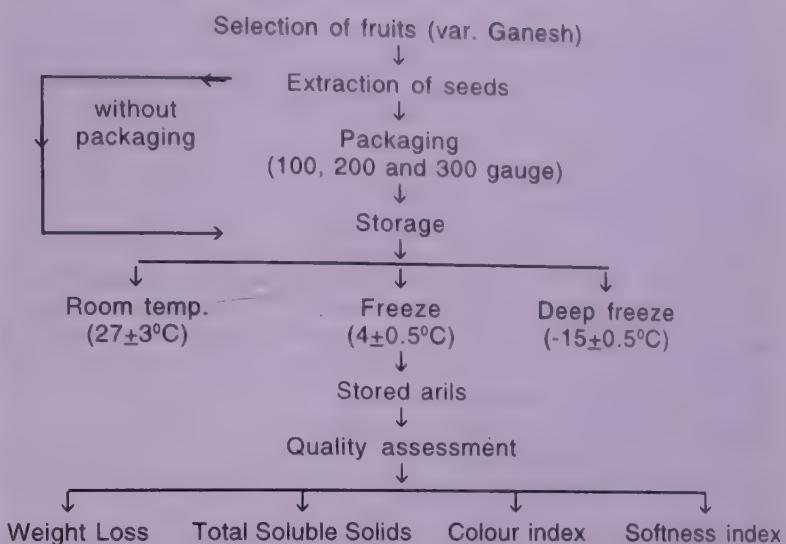


Fig.1: Flowchart for storage of pomegranate arils.

Total soluble solids (T.S.S)

The T.S.S of pomegranate arils was recorded with the help of Erma hand refractrometer (Ranganna, 1986). The sample was squeezed to extract the drop of juice in glass of refractrometer and readings were recorded during storage

Colour Index

The colour of pomegranate arils was changed from pink to dark brown during storage. The pink colour of fresh arils was changed to light pink, light brown and dark brown on storage. The colour index was defined as pink=1, light pink=2, light brown=3 and dark brown=4. Visual observations were made for the colour index.

Softness Index

The softness of arils was determined by subjective assessment of the extent of softening which was expressed as "softness index" fully firm=1, slightly softened=2, moderate softened=3 and fully softened=4. The score of softness index was given on visual observations (Chalpin and Cole, 1991).

Storage of pomegranate arils

The fresh pomegranate arils, packed in polyethylene bags (100, 200 and 300 gauge) were stored at room temperature (27±3°C) freeze (4±0.5°C) and deep freeze (-15±0.5°C). The samples without packaging were also stored as a control treatment. The temperature was measured with the help of a suitable thermometer. Pomegranate arils were stored for about 1, 2 and 8 weeks at room temperature, freeze and deep freeze, respectively.

Results and Discussion

The fresh pomegranate arils, packed in polyethylene bags (100, 200 and 300 gauge) were stored at room temperature, freeze and deep freeze. The samples without packaging were also stored as a control treatment. The stored arils were assessed for its quality, colour and softness during storage. The overall quality was found better when stored at -15°C in 300 gauge polyethylene containers. The texture and taste of arils at -15°C was found very good. The maximum shelf life of 54 days was found when the frozen arils were stored at -15°C. There was minimum weight loss of frozen arils when stored in deep freeze (0.56 to 1.10%).

Effect of storage period and method on weight loss

The pomegranate arils were stored for 5 days at room temperature, freeze and deep freeze without packaging (Fig. 2). The weight

loss increased from 12.4 to 89.51%, 2.84 to 27.52% and 0 to 2.55% in case of storage at room temperature, freeze and deep freeze, respectively. The maximum weight loss was seen when arils were stored at room temperature (89.51%), followed by freeze (27.52%), whereas, minimum weight loss was observed in case of frozen arils (2.55%). The effect of packaging and storage period on weight loss of arils stored in deep freeze is plotted and shown in Fig.3. Figure 3 shows the effect of the storage period and packaging on weight loss of arils stored in deep freeze. The weight loss ranged between 0.56 to 1.10% when stored upto 54 days. There was no weight loss in case of packaging of 300 gauge for 54 days of storage, whereas, in case of 200 gauge packaging and 100 gauge packaging the weight loss was zero upto 36 and 6 days, respectively. Therefore 300 gauge polyethylene packaging seems to be suitable compared with 200 and 100 gauge packaging. It may be due to the fact that frozen arils could be stored for longer period on packaging (300 gauge). The shelf life of frozen arils was found maximum when stored in deep freeze (54 days) followed by freeze (15 days). The shelf life was found minimum in case of arils stored at room temperature (4 days). Packaging is beneficial to avoid the weight loss of arils. The thicker packaging materials (300 gauge) may be used compared to thinner packaging materials (100 gauge).

Storage methods S1=Room Temperature

S2=Freeze

S3=Deep freeze

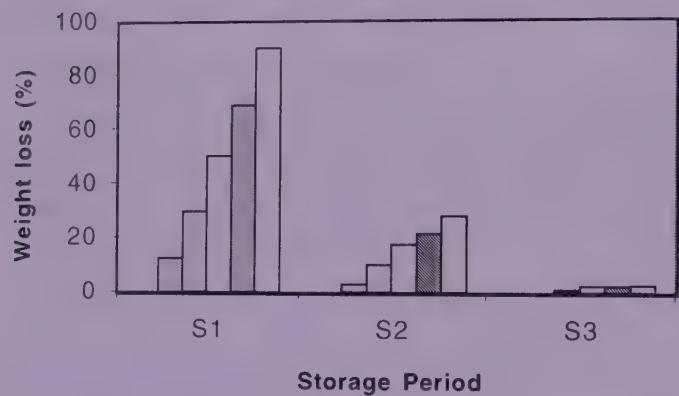


Fig 2 Effect of storage period and method on weight loss of arils

Packaging methods P1= 100 gauge container

P2= 200 gauge container

P3= 300 gauge container

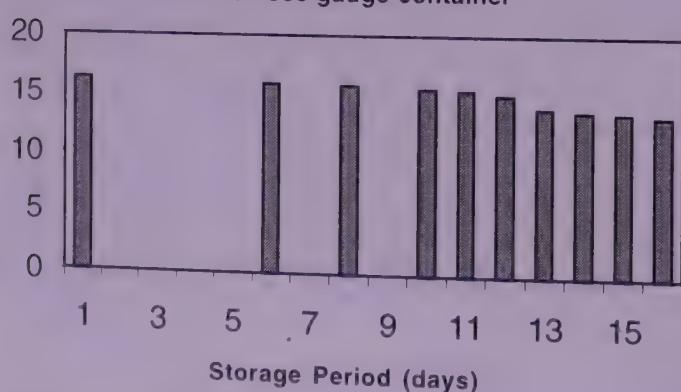


Fig 3 Effect of packaging and storage period on weight loss in deep freeze (-15°C)

Effect of storage period and method on T.S.S.

The data on effect of storage period and method on T.S.S. is plotted and shown in Fig.4. The T.S.S. decreased from 16.26 to 8.16% with storage period for all the storage methods. It is found that T.S.S. decreased from 16.26 to 8.16% within 4 days in case of storage at room temperature. The T.S.S. decreased from 16.26 to 13.52% within 15 days and from 16.26 to 13.42% within 54 days in case of storage of arils in freeze and deep freeze, respectively (Fig.4).

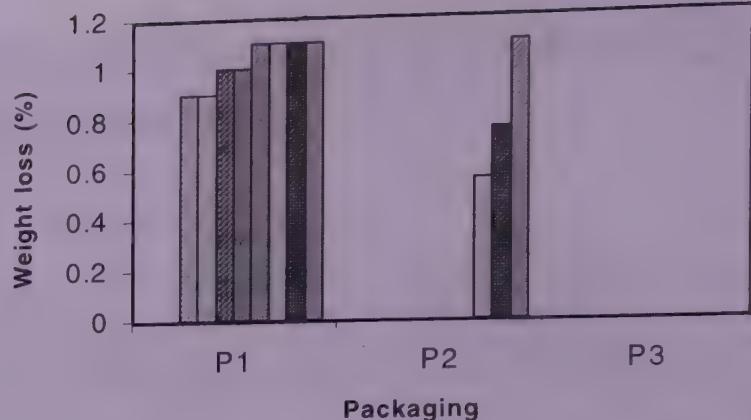


Fig 4. Effect of packaging and storage period on T.S.S. of arils stored at -15°C

Effect of storage period and method on colour index

The data on effect of storage method and period on colour index is given in Table 1. The colour index varied between 1 to 4 for all the storage methods. Colour index was maintained to score of 1 indicating pink colour of fresh arils even after 54 days. The colour index score of 2 was found in case of arils stored at freeze indicating colour change from pink to light pink. The colour index score was found maximum of 4 in case of arils stored at room temperature for 4 days indicating colour change from pink to dark brown. The fresh pink colour was maintained in case of frozen arils stored upto 54 days.

Effect of storage period and method on softness index

The data on effect of storage method and period method on softness index is given in Table 1. The softness index varied between 1 to 4 for all the storage methods. It is seen that softness index was maintained to score of 1 indicating fully firm arils stored for 54 days when stored at -15°C. Softness index score of 2 was found in case of arils stored at 4°C indicating that arils changed from fully firm to slightly softened. Softness index score was found maximum in case of arils stored at 27°C for 4 days indicating that arils changed from fully firm to fully soft.

Table 1: Data on effect of storage method and period on colour index and softness index.

Storage Period (days)	Colour Index			Texture Index		
	Storage temperature		Storage temperature	Storage temperature		Storage temperature
	27°C.	4°C	-15°C	27°C.	4°C	-15°C
0	1	1	1	1	1	1
1	2	2	2	2	2	2
2	3	3	3	3	3	3
3	4	1	4	4	1	1
4	4	4	4	4	4	1
6		2	1		1	1
9		2	2		2	2
12		2	1		2	1
15		2	2		3	1
18			1			1
24			1			1
30			1			1
36			1			1
42			1			1
48			1			1
54			1			1

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Whey Protein Hydrolysates — Production and Utilisation

by

K. Sudheer, S.K. Kanawjia* & Sudhir Singh

Introduction

Proteins are nowadays increasingly used as functional ingredients in food formulations, but all proteins do not have the same functional properties. Further the same functionality may not be exhibited at the conditions desired (like pH, acidic or neutral side etc.) and some of them may be allergenic. By hydrolysis of proteins their functionality or nutritional characteristics can be changed in the desired manner.

Protein hydrolysis can be accomplished with enzymes, acids or alkali but enzymatic hydrolysis is strongly preferred over other methods for producing hydrolysates because chemical methods can destroy L-form amino acids, produce D-forms & can form toxic substances like lysino-alanine (Lahl and Grindstaff, 1989).

The most important selection criteria for proteins in nutritional hydrolysates are nutritional value, cost, taste, antigenicity, solubility and functionality.

As whey proteins are cheaper, have high nutritional value and good functional properties (soluble even at their pI) they are perfectly suited for hydrolysates production. But some of the problems with whey proteins if used without hydrolysis are:

1. They may be responsible for allergenic reactions in some infants.
2. They have lesser surface-active properties when compared to costlier egg proteins.

Proteases are the enzymes, which are used for this purpose. Proteases are categorised according to the specificity of the peptide bonds they attack and the mechanism by which they act. Usually single purified enzymes cannot provide the peptides, which suit our needs hence enzyme mixture is used. The enzymes generally used are pancreatin (a mixture of trypsin and chymotrypsin), papain, ficin, pepsin, acid fungal protease etc.

Selection of enzyme or enzyme mixture often depends on the ability of the enzyme to achieve the desired effect. As basically it is an enzymatic reaction, the different factors like enzyme specificity, extent of protein denaturation, substrate concentration, pH, ionic strength, temperature, presence of inhibitory substances affect the hydrolysis.

Whey protein hydrolysates that tend to be used in nutritional formulations are hydrolysed to a greater extent and are classified as slightly, moderately and/or extensively hydrolysed depending upon the molecular weight distribution of the resultant hydrolysate. The extent of hydrolysis is very important because, extensively hydrolysed ones are used in hypoallergenic formulations whereas hydrolysates used as protein supplements are moderately hydrolyzed. The extent of hydrolysis is generally measured or termed as degree of hydrolysis (Mahmoud, 1994).

The extent of hydrolysis is quantified as the degree of hydrolysis (DH), which refers to the percentage of peptide bonds cleaved. The DH is commonly measured and monitored by

- i) The amount of base that is consumed to maintain the pH during hydrolysis (pH-stat method)
- ii) Depression of freezing point, which indicates increase in osmolarity (osmometry) (Dinaker and Kilara, 1996)
- iii) By increase in solubility in TCA (Nissen, 1986)

The other method used to measure the extent of hydrolysis is AN/TN ratio, the amount of amino nitrogen present in

hydrolysate relative to the total amount of nitrogen present in the substrate. In this method amino-nitrogen (AN) is measured by formaldehyde titration and total nitrogen (TN) by Kjeldahl method (Lahl and Braun, 1994).

pH stat method and osmometry methods are easy to perform, allowing continuous monitoring of the hydrolysis process whereas the AN/TN ratio method is time consuming and cannot be used as on-line process control method.

Hydrolysis

Commercial scale hydrolysis takes place in batch processes, using large vessels containing aqueous mixtures of substrate and enzyme. In this method, an optimal enzyme to substrate ratio is developed and then accordingly enzyme is added to the protein and the conditions of hydrolysis are maintained till desired DH is obtained. Once the desired DH is obtained then the pH and temperature are adjusted simultaneously to a point where enzyme gets inactivated. Both are adjusted simultaneously because either of them alone may destroy the nutritive quality.

Other ways of terminating the hydrolysis is removal of enzyme by membrane filtration or diatomaceous earth, fibreglass depth type etc. Again to confirm termination of enzymic activity a dye gelatin test is used in which gelatin colour units are monitored colorimetrically as a direct measure of residual activity (Rollema *et al.*, 1989).

As this method is time consuming, costly (enzyme used only once), and requires further steps like inactivation, then testing etc., hence it is being replaced by continuous methods like enzyme immobilization method etc. In this method, the required enzyme is immobilized onto a matrix in a bioreactor and the substrate (whey proteins) comes into contact, gets hydrolysed and then hydrolysates are removed. By this method we can save enzyme (as it can be reused), make the process continuous and requires no inactivation step, as enzyme does not go with product. Perea and Ugalde, 1996 reported whey protein hydrolysis in a membrane recycle reactor in the presence of alcalase 0.61. Substrate conversion was directly dependent on enzyme substrate ratio and residence time and that if enzyme to substrate ratio was fixed at 10%, level conversion levels could be controlled through residence time which resulted in peptides of homogenous molecular and functional properties.

Processing methods

After the hydrolysates are produced, their characteristics like flavour, colour, amino-acid profile and molecular weight distribution can be changed by applying the following processing methods.

Charcoal treatment: This removes higher molecular weight peptides, colour and to some extent bitterness.

Filtration: Hydrolysates are filtered to remove insoluble substrate fragments and enzymes. Different methods like UF, microporous MF or de-filtration can give hydrolysates with high degree of optical clarity and no high molecular weight peptides.

UF is nowadays increasingly used as it can, not only terminate hydrolysis (in case of batch method) but also permits a normal distribution of amino acids and short peptides without extensive hydrolysis.

Now enzyme is being immobilized on membrane matrix itself so that all the above advantages can be utilized along with hydrolysis thus acting as bioreactor as well as filtration method. Reverse osmosis is also being used to reduce the free amino acid content in hydrolysates (Nakamura *et al.*, 1993).

Then the finished hydrolysate is normally stored or supplied as powder.

Effect of Hydrolysis

Three distinct effects accompany enzymic hydrolysis of proteins

1. A decrease in molecular weight and thus resulting in decrease in antigenicity.
2. An increase in the number of ionisable groups and thus increase in hydrophilicity and net charge.
3. The exposure of hydrophobic interior to the aqueous environment

These changes directly affect the functional properties of hydrolysates like change in solubility, emulsifying and foaming properties, gelation etc. The resultant hydrolysate will have both high and low molecular weight peptides and can fractionate them using membrane filtration with appropriate cut-off range to get permeate as well as retentate and use them accordingly.

Allergenicity

Food allergy is most frequent in infants and most serious in adults. Between 5-10% of normal full term infants will develop some kind of food allergy (Cordle, 1994). In infants, allergy to cow's milk is the most common probably because milk protein is most widely used infant nutritional protein. Treatment of food allergy requires complete elimination of responsible food from the patient's diet. But for infants the non-breast milk food protein choices are largely limited to cow milk or soy. In this case strict elimination leads to malnutrition.

But the poor and slow degradation of the epitopes of whey proteins when pepsin digestion occurs under conditions that prevail in infant's stomach is responsible for cow milk hypersensitivity. The large antigenic fragments of these proteins pass through the immature gastrointestinal mucosal barrier of infants and causes cows' milk allergy (i.e. diarrhoea, eczema and other allergic reactions). To avoid these problems most commercial firms use protein hydrolysates in infant formulae. The main proteins of whey (α -lactalbumin and β -lactoglobulin) have high nutritional value but allergenicity is their serious drawback. Hydrolysis can reduce this allergenicity, as these large fragments are broken to smaller peptides.

The enzyme specificity rather than the DH or molecular weight distribution of hydrolysates determine the residual allergenicity of whey protein hydrolysates and also Ultrafiltration is a prerequisite for obtaining hypoallergenic whey protein hydrolysates (Ena *et al.*, 1995). If UF membrane with 5000 cut-off range is used it yields a low antigenicity hydrolysate and also we can get a retentate of higher peptide fractions, which may have different functional properties. High DH can be achieved by bacterial proteinases than animal ones and also molecular weight <1000 can be achieved when the $DH >= 20$ (Gonzalez - Tello, 1994a,b). Minimum molecular weight capable of eliciting immunogenicity and allergenicity of whey protein hydrolysates appears to be between 3000 & 5000Da and so the molecular weight cut-off value of UF must be in this range (Beresteijn, 1994).

Susano Castro *et al.*, 1996 has reported that the enzymatic preparation obtained from *Bacillus subtilis* can be used for reducing allergenicity of the proteins of acid whey and also avoiding the formation of bitter peptides. Hydrolysis appears adequate at pH 4.0 and temperature near 33°C. Alternatively it has also been suggested that feeding whey protein hydrolysates to lactating women and as well as to infants, aids in preventing allergy developments (Fukushima, 1997).

Solubility

The most important physico-chemical and functional properties of whey protein hydrolysates is their change in solubility. The increase in their solubility may be due to smaller molecular size or newly exposed ionisable amino and carboxyl groups.

Normally whey proteins have good solubility over wide pH range but if they are heat denatured, isolate of their solubility is impaired but hydrolysis of heat-denatured proteins with trypsin restores the loss of solubility to a great extent (Mutilinga *et al.*, 1995). Whey proteins when hydrolyzed with trypsin were soluble

at all pH range and thus could be effectively used in foods with different pHs (Ju, 1994). Thus heat denatured whey protein hydrolysates can be utilized in the supplementation of fruit drinks, which have acidic pH and thus improve their nutritional characteristics. Further the increased solubility (especially at low pH) becomes beneficial in infant formula as they contain reducing sugars and to prevent Maillard browning they are formulated in acidic pH region. Also whey protein hydrolysates have high thermal stability and thus can be used in high temperature processing products without any sedimentation and are also stable in presence of minerals.

Gelation

Whey proteins can form irreversible heat induced gels. Gelation properties (both gelling ability and gel strength) can be manipulated by hydrolysis of whey protein as a function of pH, DH, concentration. Whey proteins hydrolysed with a bacterial protease formed a strong gel at 12% concentrate. Whereas a same concentrate whey protein hydrolysed with trypsin prevented the gelatin. Thus by using these whey protein hydrolysates we can make very strong heat set gels in neutral pH range (Ju, 1995).

Emulsifying properties

As infant formulae are nothing but protein stabilized emulsions emulsifying properties of whey protein hydrolysates are important. The emulsifying properties of protein hydrolysates are dependant on DH as it affects the hydrophobicity of peptides. 3% DH whey protein hydrolysates have maximum emulsifying capacity but higher degree was detrimental (Liske and Ger Konrad, 1996).

Also it is reported that with 5% DH whey protein hydrolysate (whey protein hydrolysates) there was slight flocculation but no creaming in emulsions (Agboola *et al.*, 1998). The mean length of peptides in the hydrolysates that are effective emulsifiers is about 5 amino acids and it also depends on the enzymes, since enzymes do not attack protein randomly but at specific sites. The peptides with low and medium DH are sufficiently surface active to provide stable emulsions, they are incapable of preventing coagulation of emulsions during heating thus limiting their use in products requiring can retort heating or sterilization. To a limited extent emulsion stability could be affected by mixing different peptide preparations after an emulsion is formed using one of them. Also heating the whey protein hydrolysates after hydrolysis affects the functional properties and it has been reported that emulsion resistance to coalescence increased when the hydrolysate was heated at pH 4.0 and so while it decreased at pH 6.0 indicating that this can be used in high acid foods.

Foaming properties

Foamability is very important in whipped toppings, ice cream etc. Egg is generally considered as best ingredient for foaming but whey proteins also possess good foaming properties. Limited proteolysis yields peptides with improved foaming ability but stability of these foams may be affected. The molecular properties that are applicable to foaming are similar to that of emulsification. Alcalase when used for hydrolysis produced permeate with best foaming properties, which were comparable to egg white (Althouse *et al.*, 1995). Some authors have reported that limited papain proteolysis and selective UF of whey proteins (3%) have good foaming properties (Liske and Konrad, 1996).

Mutilinga *et al.*, 1996 have reported that after the hydrolysis and fractionation by UF, permeates from alcalase hydrolysate had the best foam capacity but low foam stability, but fraction generated by trypsin did not exhibit the same. Interesting thing here to note is that the retentates had higher emulsifying capacity indicating that DH has a definite role to play in surface active properties. Whipping properties of hydrolysates improved when heated at pH 8.0 while the effect on foaming properties was slight when heated at pH 4.0 or pH 6.0 indicating that whipping properties can be modified by heating while controlling the pH and concentration.

Debittering

A common problem with extensively hydrolysed proteins is bitterness, which limits the use of these as it affects the taste of the product. Bitterness is mainly due to hydrophobic groups exposed during hydrolysis. Debittering of hydrolysates can be accomplished by any of these following methods (Pedersen, 1994):

a) **Selective separation:** Using activated carbon or hydrophobic interaction chromatography on hexyl sepharose.

b) **Masking**

- 1) Gelatin and glycine have the same effect
- 2) Cyclodextrins can mask bitterness as they can wrap the hydrophobic group of bitter peptides
- 3) Gelatinized starch, glutamic acid and aspartic acid can also be used.
- 4) Adding polyphosphates during hydrolysis.

But all these methods can only mask the bitterness but not remove them

c) **Enzymatic debittering:** plastein reaction is very efficient in which the hydrolysed protein is incubated with a proteolytic enzyme which results in the formation of plastein which has no particular flavour.

The other method is the use of exopeptidases, which hydrolyse the bitter peptides and thus remove the flavour. But the main limitation with this method is that it increases the DH, which may affect its functional properties. New approach to debittering is use of those enzymes, which do not release bitter peptides, or using mixture of enzymes (exo and endogenous both) so that DH may not be the limiting factor.

Applications

As from the above discussion it is pretty clear that whey proteins can be modified in the way we desire by controlling the DH and the enzyme specifically to meet the needs.

This method may be best used to modify those whey proteins which are heat denatured to isolate i.e., heat precipitated whey proteins lose their excellent functional properties but those can be restored without increasing their cost of production significantly (as membrane processing to isolate whey proteins proves to be costly).

The other most important application of whey protein hydrolysate is its use in medical diets where patients cannot digest the whole protein and require more proteins and calories but cannot absorb and process nutrients due to malabsorption as well as improper functioning of liver or pancreas or kidney. Further whey protein hydrolysates are absorbed easily when compared to whole proteins or amino acid mixtures.

Conclusion

Whey proteins by themselves posses good functional as well as nutritional properties, when heat denatured, may lose their functionality. However, their functionality can be improved by the production of whey protein hydrolysates. Hence production of tailor made proteins by this method is a promising approach.

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Rajiv Sood

The Indian market for ready to eat food has come a long way. Though still small, it is growing rapidly. Several changes in the socio economic life of the people has triggered the beginning of transformation of our society from the one that was driven mainly for the fulfillment of basic needs to the one that is driven for improving the quality of life. Symptomatic changes are already visible, e.g. increase in the number of women working, income growth, introduction of e-life, increased awareness and knowledge, etc. Children are also being encouraged to express themselves and are treated as an adult from an earlier age resulting in different family members eating different things. These changes have also brought about demographic shifts and reduction in house-hold size, loss of cooking skills and break down of the 'family meals'. No previous decade in the country has witnessed so many changes in the life style as the nineties.

As the name suggests, ready to eat food is one that is fully cooked and can be consumed straight away after opening the pack. Different technologies are available for extending the shelf life of the food. Simple vacuum packing, chilling, freezing, aseptic packaging, pasteurizing and sterilizing are some of the technologies for increasing the shelf life of ready to eat food. The factors that are important in selecting the appropriate technology are the nature of the product, its desired shelf life and taste, climate, the degree of ease to be provided to the consumer, availability of electricity and finally the most important factor of economics.

Adverse changes in foods (spoilage) are caused by micro-organism or enzymatic activity, chemical reaction or such physical or physiochemical changes as drying or crystallization. The principle techniques to extend shelf life and retard spoilage of the food so as to make it ready to eat fall into three categories:

- * Removal
- * Suppression
- * Destruction

Removal of micro-organisms may be accomplished by filtration when the product is water-soluble, and in certain instances by centrifuging, such techniques generally must be combined with other methods in order to be effective.

Suppression of micro organic activity can be carried out by

- cooling (refrigeration),
- freezing,
- reducing water content.
- additives, such as by adding sugar or salt; fermentation; stabilization by adding alcohol or acid, chemical or biological substances.
- aseptic processing and packaging. The process may be classified into three technologies:
- Ultra-high temperature (UHT) pasteurization of liquids, combined with aseptic packaging,
- aseptic canning of particulate foods such as fruits and vegetables currently frozen or canned, and
- aseptic bulk storage of products.

The most widely used and effective technique for destruction of micro-organisms is heating, the only negative result of which is that beyond certain temperatures the quality of the product may be affected. Radiation is another method, although it may, at high levels, cause undesirable chemical reactions.

Chicken is one of the most popular foods for non-vegetarians in India. The shelf life of its products is usually extended by freezing the products, i.e. suppression of micro organic activity, or by heat treatment, i.e. destruction of micro-organism. In the Indian, climatic-

economic-socio conditions, heat treatment is more suitable solution for extending the shelf life of its various chicken preparations like sausages, salami, nuggets, burger patties, kababs, koftas, keema and a variety of curried items. The end products can be fully or partially cooked as may be required by the producer.

The heat treatment: in the common parlance, when we say, "food is spoilt" it's meant that the bacteria in the food is grown to an extent that it has made the food unsafe for human consumption. The bacteria can also be transmitted into the food by the container into which it's packed. In the heat treatment technology, the food is subject to heat after packaging so that the bacteria in the food and the packaging into which it is packed, is destroyed. The temperature is kept in excess of 100°C for a desired length of time under counter pressure. The system of subjecting a product to heat treatment in excess of 100°C for destroying the micro organism is also popularly called as "Sterilisation". The temperature, time duration and counter pressure depend on several factors, such as

- * nature of the food
- * packaging material
- * ambient temperature
- * required shelf life.

A number of factors are considered while exacting the sterilization parameters. Consideration is to be given to the following issues:

- The raw material and ingredients are subjected to heat treatment twice; once at the time of cooking and later while sterilizing. Care should be taken not to let the product be over or under cooked.
- Careful planning for the utilities, i.e. steam, water, air and electricity should be done so that there is an un-interrupted supply of the required quantities during the production process.
- One should also be watchful about the civil work, as it should be able to bear the required heavy load of the machines, clear the waste without it getting accumulated and facilitating easy movement of goods during the production process.

When the food is properly sterilized, it remains good for eating for several months. Eating it is very easy; just open the pouch, tray, bottle or the tin and consume it straight. However, if one likes to eat it hot, dip the pack into hot water for about 3 to 5 minutes and then open the pack for eating. It gives the taste almost as if cooked fresh. The sterilization of food has several advantages in the Indian market. For example,

- it does not require refrigeration resulting in considerable saving of energy and money to the producers, stockists, retailers and the consumers. The city administration is also relieved of some demand pressure for power.
- perishable food can be economically and more comfortably supplied to remote, difficult and far off areas.
- the chances of food spoilage due to power failure, inadequate handling or storage are drastically minimized.
- 'food poisoning' will be a thing of the past.
- relief from cooking to convenience to the working ladies, travellers, party buffs, etc. will be provided.
- being much lower priced, vis-a-vis the restaurant food, it is a lot more affordable.
- for calorie cautious people, it's good news, as the whole food can be consumed without one having to fry it.
- fully cooked food can be quickly rushed as relief material to people struck with sudden disasters.
- delicious and nutritious food can also be sent to the soldiers serving in in-hospitable conditions.
- huge wastages of agricultural food can be reduced when more and more food is further processed,
- the farmers can be better rewarded as they can enter into contract farming agreements with the processors.

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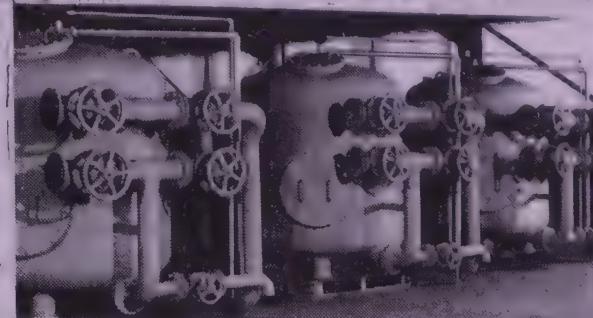
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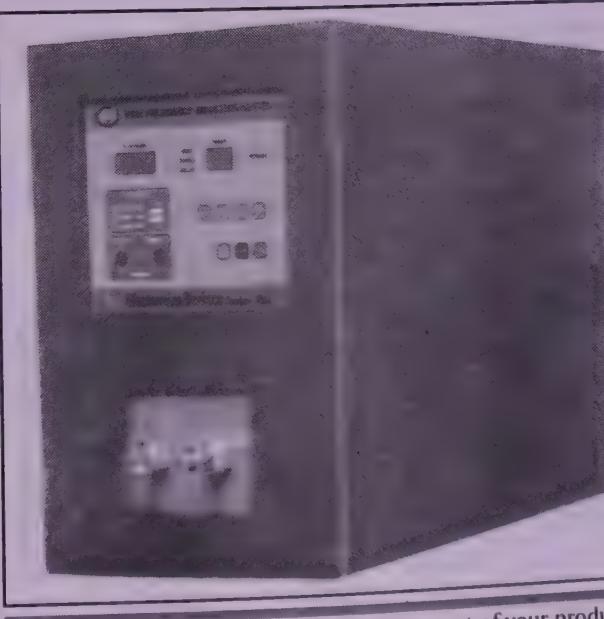
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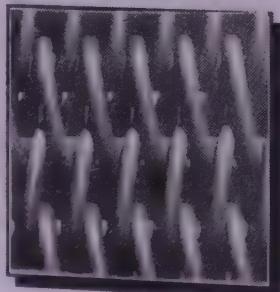
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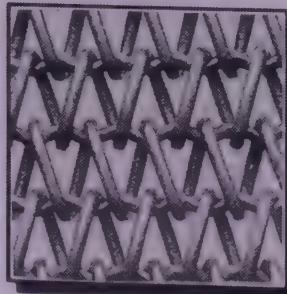
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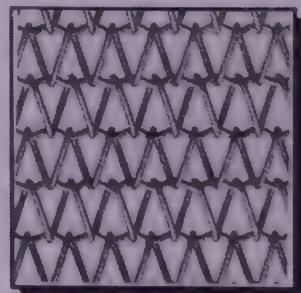
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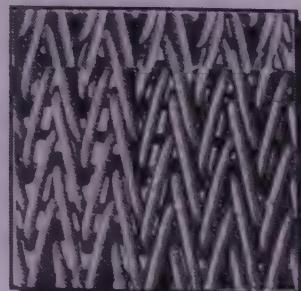
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Optimization of Whey Based Mango Beverage

by

Prasad, K., Sharma, H.K.* Mahajan, D. and Jaya

Abstract

Whey based mango beverages were prepared from the variations in the proportions of sugar and whey and were tested for its quality by sensory and physico-chemical methods. The specific proportions of sugar and whey were designed using Central Composite Rotatable Design (CCRD). It was observed that sensory flavor and overall acceptability (OAA) scores of mango beverage varied from 6.23 to 8.76 and 6.96 to 7.95, respectively. The differences in the sensory scores for respective attributes were highly significant ($P \leq 0.01$). The beverage containing 12% sugar and 20% whey resulted in 17° Brix and 48.57 to 51.52 TSS-acid ratios, which were the best in terms to their flavor and overall acceptability. Sensory data were regressed against sugar (X) and whey (Y) for second order polynomial methods, which were found to be adequate as coefficient of multiple determinants (R^2) was more than 80%.

Introduction

Whey is the milk serum that is produced during the manufacture of cheese, casein, paneer etc. and is considered as a waste product especially in underdeveloped and developing nations. Though, whey must be seen as a byproduct with valuable nutrients, whose manufacture or proper utilization has been proved to be economical on the commercial scale. It has been estimated that the whey production in India has been reported to be more than 70 million liters. A large part of this important material is not being utilized and drained into gutters, which may either cause environmental problems or large expenditure in the treatment.

The utilization of whey is known in different types of beverages. Vasil and Raspopva (1981) prepared a whey beverage by adding 10-13% of sweet briar (extract obtained by comminuting plant fruits to a particle size of 1.0 – 1.5mm before extraction) and 2-3% sugar. A new beverage based on cheese whey and grape juice has been reported (Sciancalepore *et al.*, 1992). The keeping quality of whey beverage containing 8% lemon juice and 14% sugar was examined. It was observed that the beverage can be preserved for 15 days at room temperature without any significant change in the acceptable quality (Dhandayuthapani *et al.*, 1997). The procedure for manufacture of guava and whey based beverage has been standardized (Singh *et al.*, 1999). Several other research workers also reported the importance of utilization of whey in whey fruit beverages which has been known since a long time but, the scale of exploitation is still very less on commercial scale. Therefore, the study was aimed to optimize the process for the mango-whey based beverage.

Materials and Methods

Cow's milk and mangoes (Langra variety) were procured from reliable sources. Flavour mango ripe and citric acid were obtained from Bush Boake Allen (I) Ltd., Chennai and Glaxo Chemicals, Mumbai respectively.

Methods

Preparation of whey

The whey was obtained from standardized cow milk (4.0% fat) by simple acid coagulation method (2.0%) citric acid. The precipitation of whey protein was carried out at 0.5% acidity by boiling for 15 minutes and allowed to settle the proteins for six hours. The small amount of fat present in whey was separated by passing through a cream separator. The nearly fat free, clear whey was used for the preparation of the beverage base.

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Preparation of mango pulp

Mangoes were sliced and pulped through a pulper cum finisher (Gardeners Corporation, New Delhi). The pulp is acidified to 1.0% by citric acid and preserved using 800 ppm of SO_2 . The preserved mango pulp was used in the preparation of the beverage.

Preparation of mango beverage

The beverage was prepared with the addition of sugar and whey as per central composite rotatable design (CCRD) given in Table 1 and followed by 15% mango pulp, citric acid (0.165%) and flavour. The final weight was adjusted with water.

Table 1. Plan of experiment for the study of sensory and physico-chemical characteristics of mango beverage.

Experiment Number	Experimental and coded values		
	Sugar (gm)	Whey (gm)	
1	7.76	-1	5.86 -1
2	16.24	1	5.86 -1
3	7.76	-1	34.14 1
4	16.24	1	34.14 1
5	6	-1.414	20 0
6	18	1.414	20 0
7	12	0	0 -1.414
8	12	0	40 1.414
9	12	0	20 0
10	12	0	20 0
11	12	0	20 0
12	12	0	20 0
13	12	0	20 0

Analysis

Physico-Chemical Parameters

Total soluble solid (TSS) of the samples was measured using hand held refractometer (Range 0-50° Brix, Gardner corporation, New Delhi) at 20°C. Titratable acidity of the samples was estimated by potentiometric titration (A.O.A.C., 1980).

Sensory

The sensory evaluation for flavor and over all acceptability (OAA) of whey beverages was subjected by a panel of eleven judges from faculty and students of Food Technology Department. They were asked to judge the samples adopting the 9 point hedonic score card as described by Ranganna (1986).

Statistical

The observed responses for sensory and physico-chemical parameters were regressed against sugar and whey levels for second order polynomial model. This model was analyzed for its adequacy on the basis of co-efficient of multiple determinants (R^2). According to Joglekar and May (1991) a value of R^2 of more than 0.8 described the good approximation for the suitability of the model.

Results and Discussion

Whey beverages, obtained from the combination of various constituents as given in Table 1 were tested for its quality by sensory and physico-chemical methods. Sensory flavor and overall acceptability (OAA) scores of mango beverage varied from 6.23 to 8.76 and 6.96 to 7.95 respectively. The differences in the sensory scores for respective attributes were highly significant ($P \leq 0.01$). Sensory color and mouth feel scores varied from 7.08 to 7.58 and 7.02 to 7.77, which were found to be insignificant. The minimum flavor score was observed in experiment no. 5, which contained 6% sugar and 20% whey. This beverage formulation had lowest TSS (11° Brix) and TSS-acid ratio (33.33), which resulted in poor taste and inferior mouth feel. Experiment number 9 to 12 containing 12% sugar and 20% whey resulted in 17° Brix and 48.57 to 51.52 TSS-acid ratio which were the best in terms of their flavor and overall acceptability. The results are in close agreement with the ratio acceptability.

reported by Ramteke *et al.*, (1999) who suggested TSS-acid ratio for mango syrup as 48, and 50 for mango RTS beverage and mango nectar respectively. Sensory data were regressed against sugar (X) and whey (Y) for second order polynomial model (Eqn. No. 1-3). These models were adequate as coefficient of multiple determinants (R^2) and were more than 80%. Flavor = $8.22^{***} + 0.51X^{**} - 0.15Y^{ns} + 0.26XY^{ns} - 0.70X^2^{***} - 0.47Y^{2**}$ — (1)
OAA = $7.73^{***} + 0.18X^* - 0.07Y^{ns} + 0.08XY^{ns} - 0.33X^2^{***} - 0.22Y^{2**}$ — (2)
TSS - Acid = $50.02^{***} + 12.46X^{***} - 0.73Y^* - 0.28XY^{ns} + 0.16X^2^{ns} - 0.43Y^{2ns}$ — (3)

Ratio

***significant at 1%, **significant at 5%, *significant at 10% and ns non-significant

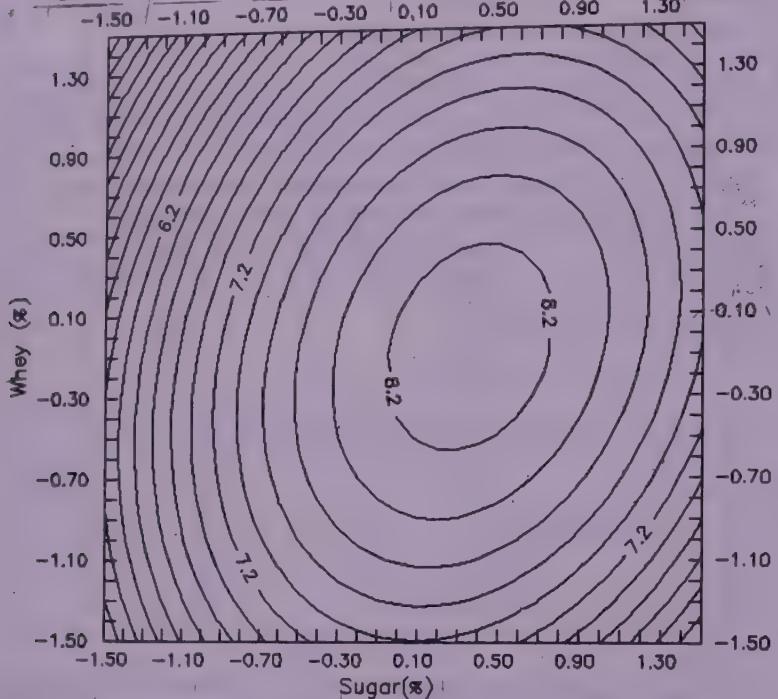


Fig. 1. Effect of sugar and whey on sensory flavor of mango beverage

Sensory data indicated that the beverage prepared from sugar 6 – 18% and whey 0-40%, the flavor score ranged from 6.23 to 8.76 in CCRD based experiments. An acceptable beverage having sensory score more than or equal to 7 can be prepared by using sugar more than 7.33% in all combinations with whey (Fig. 1). Using sugar 10.51 to 16.24% in combination with whey ranging from 7.2 to 31.3% resulted in a highly acceptable beverage in terms of flavor, having sensory score of greater than 8. For the minimum sensory flavor score of 8, the TSS-Acid ratio was observed in the range of 46 – 63 (Fig. 3).

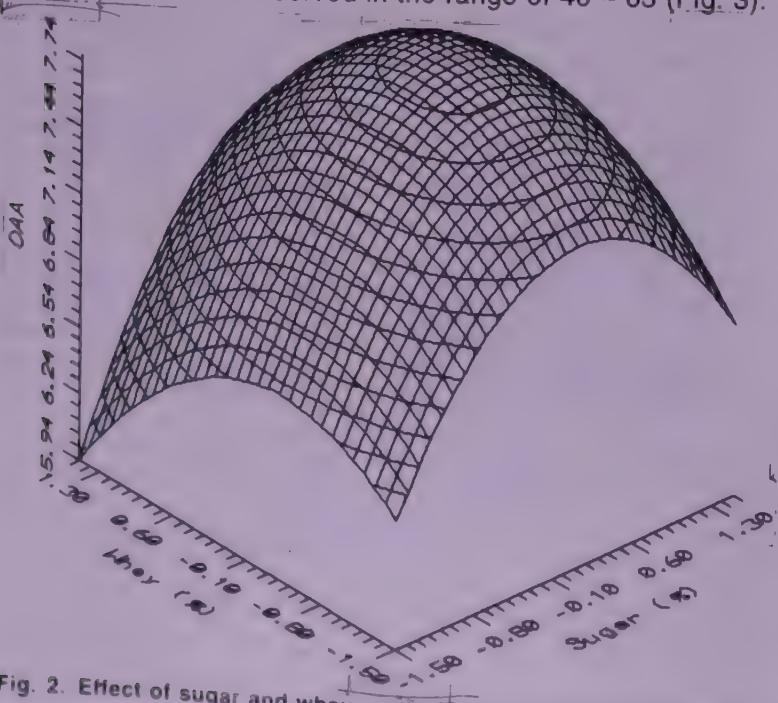


Fig. 2. Effect of sugar and whey on the OAA of mango beverage

The prepared beverages were also adjudged for the overall acceptability comprising of flavor, color and mouth feel. The proportion of sugar greater than 7.76% resulted in an acceptable beverage in terms of overall acceptability (Fig.2) in all the combinations of whey. Increasing the sugar concentration from 7.76% to 13.27% increased the overall acceptability score. Thereafter, decrease in the overall acceptability score was observed. An increase in the whey proportion increased the overall acceptability up to 20% and then a decrease in overall acceptability was noticed (Fig.2).

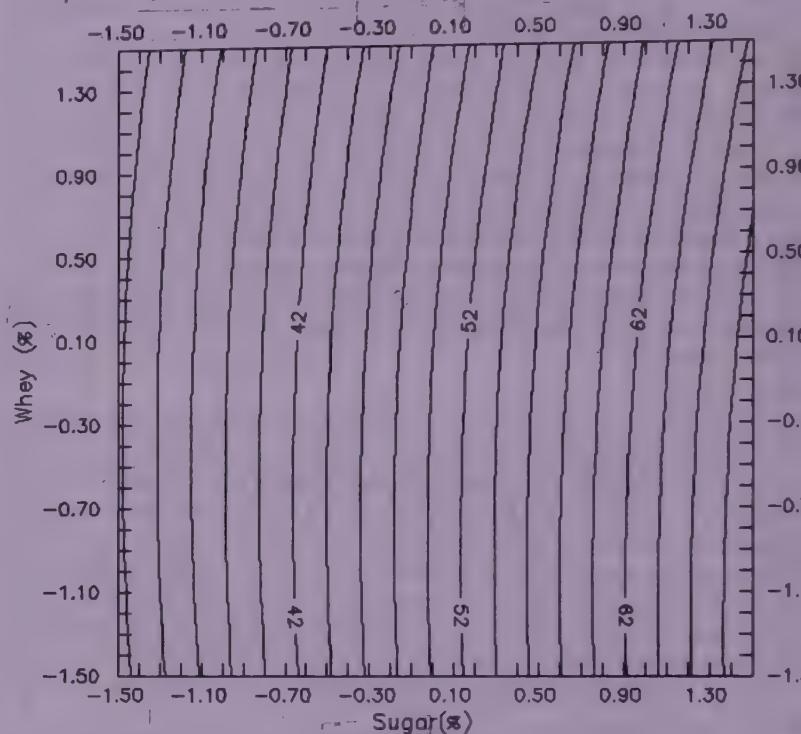


Fig. 3. Effect of sugar and whey on TSS-Acid ratio of mango beverage

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Preparation of Guava Powder by Osmo-Air Drying and its Storage Studies

by
Harsimrat Kalsi and S. S. Dhawan

Abstract

Guava powder was prepared by osmo-air drying technique from the newly developed guava hybrids H-25-25, H-11-7, H-3-22 and from existing commercial cultivars i.e. Lucknow-49 and Allahabad Safeda. The blanched slices were immersed in 70°B sugar syrup at 50°C overnight and dried at 60-65°C, in a Cabinet drier. Dried slices were ground to powder and its quality was evaluated during storage. Powder prepared by osmo-air drying technique was found better in quality than drying in oven without any osmosis. Among various hybrids and cultivars evaluated, hybrid H-3-22 was found superior followed by H-11-7 on the basis of colour (less browning), low tannins, good pectin content, high product recovery and ascorbic acid content. During storage, a significant increase in reducing sugars, moisture, pectin, browning and decrease in ascorbic acid and tannins was observed.

Introduction

Guava (*Psidium guajava* L.) is an important fruit of tropical and sub-tropical regions of the world. The important guava producing states in India are Uttar Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Punjab and Haryana. The fruit at present is consumed as fresh or canned or preserved as jelly or cheese which has some other problems in their preservation. Dehydration of guava appears to open a new outlet for the fruit. Little efforts had been made to prepare guava powder, however, Mark (1943) and Khurdiya and Roy (1974) described a method for dehydration of guava fruits after sulphuring in an ordinary drier. Good quality products cannot be prepared by ordinary drying, whereas drying under vacuum is a sophisticated process and cannot be done easily and economically on a small scale. The osmotically dehydrated product has some advantages like retention of some fruit flavour in high sugar concentration solution, less heat damage and less drying time. The technique had been earlier applied to guava (Mark, 1943 and Muralikrishna *et al.*, 1969), papaya (King *et al.*, 1951), bael (Roy and Singh, 1979) and mango (Dabhade and Khedkar, 1980).

Materials and Methods

Fruits from five guava cultivars i.e. H-25-25, H-11-7, H-3-22, Lucknow-49 and Allahabad Safeda were taken. Peeled fruits were cut into quarters and their seed core was removed. The slices were blanched in boiling water ($98 \pm 2^\circ\text{C}$) for 2 minutes. For osmo-air drying, the slices were immersed in 70°B sugar syrup at 50°C overnight. The drained slices were dried at 60-65°C. In the second method, guava slices after blanching

were dried in a Cabinet drier at 60-65°C. The dried product was ground to powder and packed in polythene bags. Moisture, T.S.S., ascorbic acid, acidity, tannins and browning were estimated by the method as mentioned by Ranganna (1977). Total sugars were estimated by the procedure of Hulme and Narain (1951).

Results and Discussion

1. Proximate composition of guava fruit: The chemical composition of guava hybrids/cultivars (Table 1) showed that among various guava hybrids H-11-7 had maximum ascorbic acid with low acidity and tannins, whereas total soluble solids and total sugars were maximum in cv. Allahabad Safeda and Lucknow-49 showed the highest acidity but lower tannins. Similar observations were also recorded by Barmanray (1992).

2. Recovery of dried powder: Recovery (Table 1) of dried product was maximum in osmo-air dried technique than cabinet drying alone. In cabinet drying without osmosis the recovery ranges from 4.92% (H-11-7) to 6.86% (Allahabad Safeda) whereas the recovery of dried product was almost double in osmo-air drying method which ranged from 13.64% (Lucknow-49) to 17.15% (H-11-7).

3. Changes during storage Total sugars

Hybrid H-3-22 recorded the highest total sugar content (59.83%) whereas hybrid H-25-25 had the lowest total sugars (Table 2). Data indicates that powder prepared by osmo-air drying technique had significantly higher content of total sugars (77.40%) than the powder prepared by Cabinet drying. In general, no significant increase in total sugar content was observed during storage. However, slight increase in total sugars was noticed in osmo-dried product. An increase in total sugar content during storage was reported by Roy and Singh (1979) in bael products.

Table 2. Changes in total sugar content (%) during storage

		Method of Drying*								Overall mean	
		Storage period (days)									
		0	30	60	Mean						
H 25-25		71.93	33.80	79.77	33.80	84.50	29.74	78.73	32.45	55.59	
H 11-7		77.06	33.80	79.10	32.45	83.83	31.77	79.99	32.67	56.33	
H3-22		74.36	44.62	77.07	41.92	82.48	38.53	77.97	41.69	59.83	
Lucknow-49		73.01	43.94	75.04	41.24	76.39	37.18	74.81	40.79	57.80	
Allahabad		71.66	46.65	75.04	42.59	79.77	37.86	75.49	42.36	58.93	
Safeda											
Mean		73.60	40.56	77.20	38.40	81.39	35.02	77.40	37.99		
Overall mean		57.08		57.80		58.20					
C.D. AT 5 % Hybrid/Cultivar = 2.79; Method = 1.76; Storage = 2.16											

* OA = Osmo-air; Cb. = Cabinet

Table 1. Proximate composition of guava hybrids/cultivars and recovery of powder

	T.S.S. (%)	Total sugars (%)	Acidity (%)	Ascorbic acid (mg/100g)	Tannins (mg/100g)	Recovery (%)	Osmo dried	Cab. dried
H 25-25	9.50	8.00	0.34	94.90	335	14.38	5.30	
H 11-7	10.50	8.10	0.36	197.70	316	17.15	4.92	
H 3-22	10.50	9.80	0.49	137.90	325	14.76	5.33	
Lucknow-49	11.50	10.50	0.53	137.40	291	13.64	6.29	
Allahabad	13.00	11.90	0.42	98.10	370	16.00	6.86	
Safeda								

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(0.44%). No significant changes in acid content was noticed during storage.

Acidity:

Maximum acidity (Table 3) was observed in products prepared from hybrid H-3-22 (1.35%), whereas minimum acidity (1.07%) was recorded in hybrid H-11-7 and Allahabad Safeda. Powder prepared by cabinet drying method recorded significantly higher (2.0%) acidity than the powder prepared by osmo-air drying in acid content was noticed

Table 3. Changes in acidity (g/100g) during storage

	Method of Drying*								Overall mean	
	Storage period (days)									
	0		30		60		Mean			
	OA	Cb.	OA	Cb.	OA	Cb.	OA	Cb.		
H 25-25	0.46	1.86	0.46	2.14	0.42	2.52	0.44	2.17	1.31	
H 11-7	0.46	1.47	0.46	1.61	0.46	1.96	0.46	1.68	1.07	
H3-22	0.42	2.21	0.42	2.28	0.39	2.38	0.41	2.29	1.35	
Lucknow-49	0.49	1.96	0.46	2.21	0.39	2.28	0.44	2.15	1.30	
Allahabad	0.53	1.61	0.46	1.72	0.35	1.79	0.44	1.70	1.07	
Safeda										
Mean	0.47	1.82	0.45	1.99	0.40	2.18	0.44	2.00		
Overall mean	1.14		1.22		1.29					

C.D. AT 5 % Hybrid/Cultivar = 0.12; Method = 0.07; Storage = 0.09

* OA = Osmo-air; Cb. = Cabinet

Ascorbic acid

Maximum retention of Ascorbic acid (Table 4) was recorded in cv. Lucknow-49 (30.95 mg) and minimum in hybrid H-25-25 (10.80 mg). Among the various methods of preparation, significantly higher ascorbic acid retention was observed in powder prepared by cabinet drying (26.42 mg) than in osmo-air drying (19.24 mg). A significant reduction in ascorbic acid content was also noticed with increase in storage period. Singh and Dhawan (1983) also reported gradual decrease in ascorbic acid content on storage of guava cheese.

Table 4. Changes in ascorbic acid content (mg/100g) during storage

	Method of Drying*								Overall mean	
	Storage period (days)									
	0		30		60		Mean			
	OA	Cb.	OA	Cb.	OA	Cb.	OA	Cb.		
H 25-25	7.14	21.90	5.24	16.50	3.57	10.47	5.32	16.29	10.80	
H 11-7	21.42	39.51	16.66	28.50	11.07	20.46	16.38	29.49	22.94	
H3-22	25.95	43.50	16.18	25.23	8.81	19.75	16.98	32.83	24.90	
Lucknow-49	45.70	36.00	36.89	22.85	25.00	19.27	35.86	26.04	30.95	
Allahabad	29.04	35.00	21.90	25.94	14.05	21.41	21.66	27.45	24.55	
Safeda										
Mean	25.85	35.18	19.37	25.80	12.50	18.27	19.24	26.42		
Overall mean	30.51		22.59		15.38					

C.D. AT 5 % Hybrid/Cultivar = 3.28; Method = 2.08; Storage = 2.54

* OA = Osmo-air; Cb. = Cabinet

Moisture

Maximum moisture content (Table 5) was observed in hybrid H-25-25 (9.37%) and minimum content was recorded in cv.

Table 5. Changes in moisture content (%) during storage

	Method of Drying*								Overall mean	
	Storage period (days)									
	0		30		60		Mean			
	OA	Cb.	OA	Cb.	OA	Cb.	OA	Cb.		
H 25-25	7.47	8.42	10.20	9.03	11.06	10.08	9.57	9.18	9.37	
H 11-7	6.87	7.96	7.46	8.44	8.69	8.87	7.67	8.42	8.05	
H3-22	7.62	7.09	9.00	7.49	9.82	8.87	8.81	7.81	8.31	
Lucknow-49	6.86	8.72	8.24	9.36	9.02	10.30	8.04	9.46	8.75	
Allahabad	6.42	7.35	6.88	7.71	7.91	8.94	7.07	8.00	7.53	
Safeda										
Mean	7.05	7.91	8.35	8.40	9.30	9.41	8.23	8.57		
Overall mean	7.48		8.38		9.35					

C.D. AT 5 % Hybrid/Cultivar = 0.53; Method = 0.33; Storage = 0.04

* OA = Osmo-air; Cb. = Cabinet

Allahabad Safeda (7.53%). Among the method of preparation of guava powder, significantly higher moisture content was observed in powder prepared by cabinet drying (8.57%) than by osmo-air drying (8.23%). During storage, a significant increase in moisture content was observed which could be due to hygroscopic nature of the product and humid weather.

Browning

Browning of dried product (Table 6) was comparatively less in osmo-air dried powder than in cabinet dried powder. Minimum browning was recorded in powder prepared from cv. Allahabad Safeda by both the methods. Browning of guava powder had increased significantly during storage. Similar results were also observed by

Table 6. Changes in browning (O.D. at 440 nm) during storage

	Method of Drying*								Overall mean	
	Storage period (days)									
	0		30		60		Mean			
	OA	Cb.	OA	Cb.	OA	Cb.	OA	Cb.		
H 25-25	0.076	0.164	0.091	0.174	0.100	0.190	0.089	0.176	0.133	
H 11-7	0.083	0.148	0.110	0.161	0.113	0.170	0.102	0.160	0.131	
H3-22	0.048	0.154	0.083	0.167	0.091	0.174	0.074	0.165	0.119	
Lucknow-49	0.073	0.190	0.078	0.200	0.086	0.251	0.079	0.214	0.146	
Allahabad	0.050	0.088	0.060	0.091	0.065	0.094	0.058	0.091	0.075	
Safeda										
Mean	0.066	0.149	0.084	0.159	0.091	0.176	0.080	0.161		
Overall mean	0.108		0.122		0.133					

C.D. AT 5 % Hybrid/Cultivar = 0.011; Method = 0.007; Storage = 0.009

* OA = Osmo-air; Cb. = Cabinet

Muralikrishna et al. (1969) in powder prepared from white fleshed Allahabad variety.

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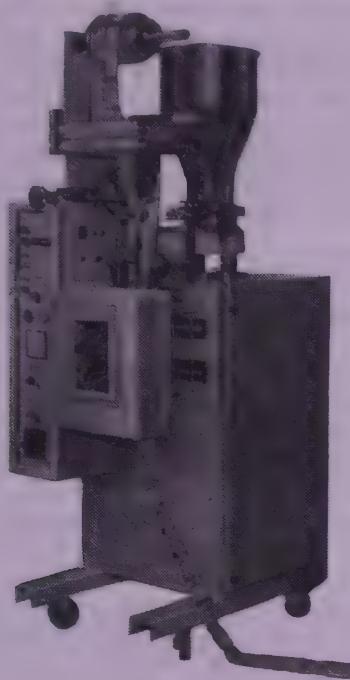
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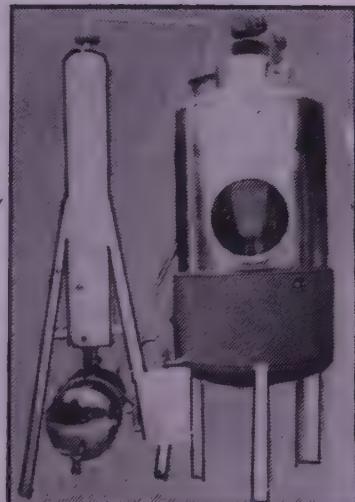
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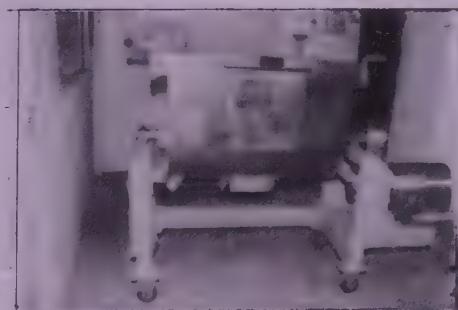
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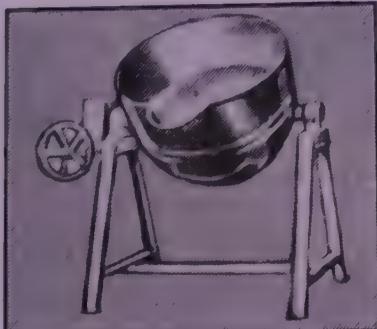
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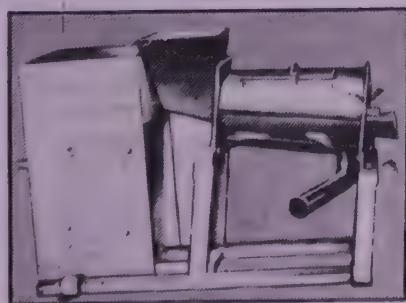
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Stand-up pouches and Flexible Packaging

In one hand a snack, in the other hand a drink. Both products can even be held in one hand if absolutely necessary. And it is in this or a similar manner that the consumer is expected in the future to indulge his or her eating and drinking habits. And because human hands have their limits, both packages are likely to be soft, smallish in size and – particularly important – easy to handle. The ideal application for flexible packaging in all its guises.

If we are to believe the packaging experts, virtually all the "shopping lists" of the various packaging industries, that is to say the producers of brand name foods, specify packaging materials and packaging containers that are expected to be available on a worldwide scale. They must be capable of being produced locally, assembled in the most amazing material combinations, and supplied in a wide range of shapes which the packager can then further enhance, e.g. by applying an attractive print. These materials also have to be cheap, very easy to transport, with maximum packaging economy for maximum product content capacity. They must satisfy a range of environment requirements, particularly those based on the irrefutable premises that more weight means more raw material consumption, and more fuel when transported. So light, flexible plastics packages seem to have it made.

Moreover, there is the situation – in Germany, for example – whereby higher waste disposal charges may be levied if weights cannot be reduced. Thus the importance of being classified as "light", as in the case of the more "eco-sound" packages, such as tubular pouches and the composite cartons used for beverages, cannot be overestimated – particularly in this era of unlimited, cross-border consumption. Because these are likely to be exempt from the compulsory deposits currently under discussion for cans and other heftier container types.

There is an increasing desire for packages to offer enhanced consumer convenience in other respects, too. Packages which fit into the microwave oven for instant heating. Packages that guarantee a long shelf life and can be divided into portions and/or re-sealed. They have to be easy to carry and indicate at a glance what is in them, what the ingredients are, what the "use-by" or "best before" dates are, etc., etc. Ideally, the shape of the package should also signal what it contains. Perhaps a distinctively contoured package in the form of a Coke bottle, showing that it contains a cola beverage? A package in the form of a cow udder showing there is milk in the product? A cosmetic lotion container in the form of a face?

The marketing people are all as one in their enthusiasm for this development. And many of these requirements can only be achieved with flexible packaging. The range of flexibles is enormously large: The list of packaging materials extends from simple paper and aluminium foil to monofoil. The pouches, the carrier bags, and also quite simple products such as garbage bags are all manufactured from plastics. More complex designs using composites, translate into more sophisticated solutions made with paper, with aluminium foil, with numerous types of plastics, plus polymers as adhesives or as a barrier layer. Plastics films or, more precisely, composite materials are also available in an extraordinarily broad spectrum of product types.

It is the plastic materials that make all the difference in these composites. Visual appearance is only one of their fortés, as seen when up to 110 different films are combined to form a spectacularly scintillating diffraction composite. This in turn can be laminated onto a cardboard box or used as a spectacular eye-catcher - for example, a label or hologram on a package. Plastics sheets can be transparent or pigmented in any conceivable colour. Plastics can be printed on the reverse side and the print thus rendered wipe-proof in a laminate. Quite simple plastics coatings have been available in the marketplace for some considerable time now, protecting cardboard, corrugated board and even paper from moisture penetration.

And the various plastics films can also be combined with one another to a virtually unlimited extent, with all their properties mingling accordingly, to give strength, provide brilliance and protect against vapours, and in order to create a barrier to exclude oxygen. Plastics can be placed in freezers and heated to very high temperatures without undergoing any degradation. A plastic packaging should be able to withstand temperatures in the deep freeze unit down to – 40°C while also resisting conditions in the microwave or oven at temperatures above 240°C.

Facts and figures

With their properties, lightness and extensive breadth of performance, plastics have made enormous inroads into the packaging sector. According to data published by the plastic trade associations, more than half of the 16 million tonnes of standard plastics which were consumed in Europe in the year 2000 were used for packaging purposes. Plastics packaging production in Germany is valued at around EUR 8 billion, which represents approximately one third of the total value for packaging materials for that year. The cardboard/paper/paperboard group notched a production volume of EUR 7.2 billion in 2000. Around one third of all products made in Europe are packaged in plastics materials, which at 12 million tonnes is ranked number two after cardboard/paper/paperboard in the western European packagings market in 1998. Around 50% of all the plastics consumed are used in the manufacture of packaging sheet and film products.

Films, thermoforming sheets, lids, thin-walled products, in other words mainly the flexible materials, constitute around 60 percent of western European consumption, while in Germany the total growth in plastics packaging products is solely attributable to flexible packaging materials. Polyethylene of high and low density (PE-HD, PE-LD), polypropylene (PP), polyvinyl chloride (PVC), polystyrene (PS) and polyester film (PE) are the star players in this packaging team.

Around the world, the ratio between co-extruded, composite and laminated sheets is roughly equal. Meanwhile, the number of colours being applied to the associated packages is increasing on a global scale, and that means that the printing machine builders are having to supply more machines capable of producing even more shades and hues. The demand for barrier and paints is constantly increasing. The associated products are specialities with expensive intermediate layers which, owing to the cost of raw materials, naturally have to be produced as economically as possible.

Moreover, film and sheet products are also having to become even more innovative. And that means: Improved welding and sealing properties, plus – almost running counter to these requirements – the possibility of resealing, with zips, stick-down tabs or at least fold-down flaps integrated in the packages.

High quality for beverages, too

With new applications being developed in the field of high quality foods such as soups and sauces as well as solid food products, not to mention highly sensitive animal nutritional products, the requirements being placed on barrier layers have further increased. This is especially the case because not all barrier layers are suitable for all composite materials; for example, they can turn PP cloudy after sterilisation. In addition, beverage packagers are obviously very keen to find alternatives to the can, glass bottle, PET bottle and composite carton because all the coatings which can be applied to a PET bottle can also be applied to plastics sheeting.

If it were not for the "CO₂ weakness" of the flexible composites, a stand-up pouch would have long been the answer to the problem of effectively containing CO₂ and excluding oxygen. However, a "flexible pouch" with a carbonated product will ter-

Contd. on Page 3

Morphology of Soy-Rasogolla as Revealed by Electron Microscopic Study

by

S.K. Gangopadhyay, S.R. Chakrabarti* & M.P. Gupta**

Introduction

Scanning Electron Microscopy (SEM) has been used for measuring the effect of processing of food products on topography and to correlate the texture of food products with their physico-chemical properties.

Rasogolla the most popular indigenous milk product is prepared by texturization of protein by controlled scalding in sugar syrup/sugar solution. Rasogolla is scaled to develop its spongy and elastic characteristics. Cow milk chhana is commonly used for preparation of best quality of rasogolla. Quality rasogolla also has been prepared from soy-milk by Chakrabarti and Gangopadhyay (1990) and their rheological characteristics also has been studied (Gangopadhyay *et al.*, 1997). Hence the present study has been made to study the morphology / micro-structure of soy-rasogolla and compare the same with that of rasogolla made from cow milk chhana.

Materials and Methods

Preparation of soy-rasogolla: Soy-rasogolla was prepared from soy-milk following the method described by Chakrabarti and Gangopadhyay (1990). The soy-rasogolla was stored at room temperature over night and was used for subsequent study.

Preparation of cow milk rasogolla: Cow milk rasogolla was prepared following the method outlined for soy-rasogolla. Milk chhana was prepared using the method of De and Roy (1954).

Morphological study: Morphological/micro-structural studies were conducted using Scanning Electron Microscope (S-405 A), manufactured by M/S Hitachi Co., Japan.

Preparation of sample

Thin slices of rasogolla (soy and cow milk) samples were taken out with the help of sharp stainless steel blade taking utmost care so that the slices do not break into pieces. The slices were washed with distilled water to remove the sugar present in rasogolla. The sugar free slices were then freeze dried. The samples for electron microscopic examination were then prepared following the method of Buma and Henstra (1971) with necessary modifications. Glue was extracted from cellophane tape dissolving it in chloroform. A drop of glue solution was placed on a metal stub and the chloroform was allowed to evaporate. Immediately after evaporation a small portion of freeze dried rasogolla sample was placed over the residual layer of glue and the sample was allowed to get fixed. The sample specimens were then gold coated in an Eiko-1 B-3 ion coater (M/S Eiko Engineering Co., Japan) under vacuum of 0.05 Torr by passing an ion current of 5mA for 5 minutes.

Scanning and viewing

The gold coated specimen samples of rasogolla (soy/cow milk) slices were scanned and viewed through a Scanning Electron Microscope (SEM) at 200X and 750X. Proper working distance, size of aperture and till of the specimen samples were adjusted as per recommendation of the manufacturer of SEM. An accelerated voltage of 15 KV was used for scanning of samples.

Results and Discussions

The morphology/microstructure of soy-rasogolla and cow milk

rasogolla (CM-rasogolla) as viewed under Scanning Electron Microscope depicted in figures given below show the structural differences amongst the soy-rasogolla and CM-rasogolla.



Fig. 1. Micro structure of cow milk rasogolla showing large vacuoles at 200X

The morphology / microstructure of rasogolla viewed under SEM at 200X revealed the surface structure of CM-rasogolla to exhibit more number of larger vacuoles (Fig. 1) than those appearing in case of soy-rasogolla (Fig. 2). However, soy-rasogolla exhibited larger number of small size vacuoles than



Fig. 2. Micro structure of soy-milk rasogolla showing small vacuoles at 200X

that of CM-rasogolla. The high quality of sponginess, juiciness and open structure of CM-rasogolla was probably due to presence of large size vacuoles in it. The presence of large number of small vacuoles in soy-rasogolla surrounded by interwoven protein strands are likely to be responsible for its closer structure. It could be observed from the figures (Fig. 1 & Fig. 2) that, the lines of the void spaces in the rasogolla samples (both soy and CM-rasogolla) were not very much different from each other. The irregular nature of borders of the vacuoles were probably due to the heat denaturation effect and nature of proteins of soybean and cow milk. Verma and Rajorhia (1995) also observed similar microstructure in case of CM-rasogolla.

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Fig. 3. Micro structure of cow milk rasogolla exhibiting uniform folded thread-like structure at 750X

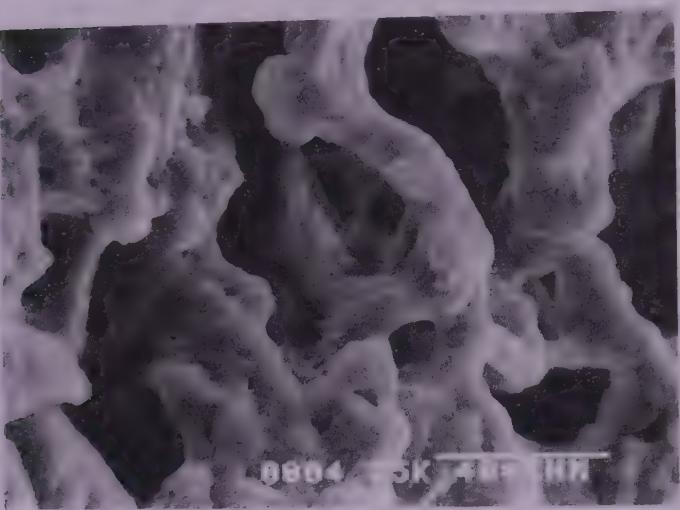


Fig. 4. Micro structure of soy-milk rasogolla exhibiting non-uniform folded thread-like structure at 750X

The study of morphology / microstructure (under SEM at 750X) of both CM-rasogolla (Fig. 3) and soy-rasogolla (Fig. 4) exhibited folded thread like structure. However, the folds appearing in case of CM-rasogolla were much different than those appearing in case of soy-rasogolla. The folds of CM-rasogolla were much uniform, where as the folds appearing in soy-rasogolla were of irregular in nature. Few folds were very thin and few were very broad in nature. The broader folds may be attributed to the nature of soy-protein or it may be due to overlapping of few threads of denatured protein. Verma and Rajorhia (1995) also have observed thread like folded structure in case of CM-rasogolla. This thread like structure is probably due to uneven shrinkage of protein during cooking (Boma and Henstra 1971). The thread like structure of milk protein (heated to 100°C) was also observed by Creamer *et al.*, (1978).

Summary and Conclusion

The morphological / micro-structural studies of soy-rasogolla exhibited lesser number of large size vacuoles than those appearing in cow milk rasogolla. The lining of the void spaces in rasogolla both in soy-milk and cow milk rasogolla were irregular in nature. Folded thread like structure were observed in both the cases. In case of soy-rasogolla the threads were of different sizes, varying from thin to thick (broad), but in case of cow milk rasogolla they were much more uniform.

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Stand-up Pouches & Flexible Packaging

to inflate, or perhaps one should say: at the moment still tends to inflate.

In any case, each of the major, globally active producers of flexible packaging is also talking to the beverage industry. Annual production of vertical pouch machines is already estimated to have a value of over EUR 600 million. And this figure only relates to the "simple" machines for, say, milk in tubular pouches. Here again, Europe is no. 1, ahead of North America and Latin America and Japan.

If one takes the three most important markets for stand-up pouches in general, the share enjoyed by pouches will almost double there in the next five years, according to American estimates.

- Europe is expected to see a consumption increase from 5 – 7 billion pouches in the year 2000 to 10 – 12 billion pouches in 2006.
- Japan will experience a jump from 4 billion to 6 billion SUPs and here the consumption of flexible pouches with active oxygen traps in the pack is already estimated at 1 billion pieces.
- In the member states of NAFTA, consumption is expected to grow from 4.8 billion to 12 billion pouches over the same five-year period.

All in all, around 15 billion units in 2000 with the forecast of a rise to 28 billion by 2006. It must be remembered in this context that, for a producer of flexible stand-up pouches, a print production order of 1 million pieces with volume of 200 ml per pouch is in itself quite a haul. Beverages have already run up a figure of 3.5 billion pieces since 2000 in the NAFTA territories alone (USA, Canada, Mexico). By 2006, this value is expected to precisely double. If, however, the "barrier-wary" PET bottle coaters were to enter into this market, these figures would simply go right out of the window.

Dry animal feed accounts for 300 million units, a figure expected to increase to 800 million. Wet feed is expected to rise from 200 million to 2 billion, snacks from 300 million to 700 million, deep freeze pouches from 100 million to 500 million, and other products and sanitary articles in stand-up pouches from, in each case, 100 million pieces to 300 million units, all by the year 2006.

Global players

Around the world, the global players are constantly endeavouring to further increase the performance of these stand-up pouches. Major flexible-pouch specialists have already committed a great deal to this quest. The market capitalisation of the ten largest manufacturers, almost all of which are American companies, lies in the region of US\$ 14.5 billion. The top European leaders, which are naturally also active worldwide, account for a capitalisation of around EUR 3.4 billion. In fact, the largest joint venture in Europe has only just been established, with sales amounting to EUR 1 billion, with a second supplier also aiming to achieve sales figures of this magnitude.

Excerpts from a press release of the K2001 the 15th International Trade Fair for Plastics & Rubber which was held in Dusseldorf 25th Oct. 2001 to 1st Nov. 2001.

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Recent Techniques in Oil Extraction for Food Uses of Deoiled Meal

by
Dilip Mahale

The oil is obtained from oilseeds by three methods i.e. by i) full pressing with high pressure screw presses for materials exceeding 20% oil content, ii) direct solvent extraction for oilseeds with oil content less than 20% and iii) combination of pre pressing of oilseed containing higher percentage of oil in a low pressure screw press followed by solvent extraction.

Mechanical Expression

The screw press is used in two ways for expression of oil from oilseeds.

- i. Full pressing, also known as high pressure, leading to a low residual oil content in the cake.
- ii. Pre pressing also known as low pressure pressing, prior to solvent extraction.

The four basic stages which influence the pressing efficiency in screw pressing are: • Raw material preparation • Pretreatment/ cooking • Screw pressing and separation of oil • Their return of meal / cake to screw press.

Efficient oil expression is not possible unless all the four steps are performed properly.

Raw Material Preparation

It includes cleaning for removal of foreign matter, drying to attain desired moisture level, cracking and dehulling. Breaking, conditioning and flaking is a necessary step in solvent extraction. Proper seed cleaning is a must to avoid contamination of products intended for food uses. Specially, use of magnets is advocated to remove ferrous materials which are not desirable for machine as well as food.

Dehulling of oilseeds like soybean, sunflower, groundnut etc. is preferred for getting good quality meal for food uses. However, for easy movement of materials in machine, some husk percentage is desirable. For solvent extraction, this condition is not necessary. Also since the hull contains very little oil, they absorb oil during oil expression and reduce oil recovery. The powdered hulls are sometimes added back to a portion of the meal to provide fiber and roughage to feed rations. The purpose of seed cracking is to help in heat penetration, during cooking, due to increase in surface area.

Pretreatment / Cooking

The most important step in seed preparation is cooking or hydrothermal treatment of the ground or flaked oilseeds. The cooking temperatures may vary in the range 70-110°C, depending upon the type of seed and oil expression process. This unit operation serves different objectives such as, rupture the oil globules for ease of oozing out, increase flowability of the oil, render cell walls more permeable to oil flow, increase plasticity of crushed seed for fast, efficient pressing, inactivation of anti nutritionals like trypsin inhibitor, etc. and toxic substances like gossypol, alfatoxin, etc. deactivation of the lipase that release free fatty acids and increase refining losses, destruction of enzymes which are detrimental to oil and meal quality.

Enzymatic Hydrolysis

The oil globules are found inside plant cells, associated with proteins and a wide range of carbohydrates. The cell contents are surrounded by a rather thick cell wall which has to be ruptured for the protein and oil to be released. Enzymatic hydrolysis is an option for pretreatment of oilseeds as it opens up the cell wall through bio degeneration. It also hydrolysis the

complex lipoprotein and lipopolysaccharide molecules into simple molecules, thus releasing extra oil for extraction. This has yet to become a part of commercial activity.

The temperature and pressures are much lower than for high pressure pressing. Prepressing leaves one-third of the oil in the meal. At this level of residual oil content the cell walls are effectively fractured during shearing action of the worm shaft and cake is permeable to allow for good percolation of the solvent.

Oilseeds containing higher oil content are crushed in expellers for getting oil. Solvent extraction is avoided for the main reason that the requirement of solvent is appreciably enhanced. Since the solvent extraction method is used for removing the remaining oil, almost all the oil present in the oilseed is recovered. It has therefore, become quite common to first pre-press the oilseed in mechanical presses and subsequently extract extra oil through solvent extraction technique. Another advantage of this approach is that the oil meal / cake obtained is relatively of better quality for use in food preparations. The cake obtained through only mechanical expression has the dark colour due to repeated exposure of meal to heat during number of passes for getting more oil recovery. Also, deterioration in the protein quality takes place due to irreversible change in protein structure due to exposure of cake to excessive heat during recycling.

Solvent Extraction

The most widely accepted and recent method of oil expression is the solvent extraction method. This is a continuous process. This method has proved to be excellent for oil bearing materials like soybeans which contain low oil content. Even today, soybean oil is most commonly extracted employing solvent extraction method.

Solvent Extraction of Soybean Oil

In this process, soybean seeds are subjected to preliminary cleaning and cracking followed by steaming for moisture addition and making it eligible to flaking by rendering softness to cotyledons. During this process, some anti nutritional are also inactivated. Flaking of oilseeds like soybean is preferred for easy absorption of solvent. The flaking is done using flaking rolls to get 0.3 mm thick flakes.

The solvent (Hexane) is then sprayed over a bed of flakes and allowed to flow through flakes to extract oil. The mixture of oil in solvent referred to as miscella slowly moves away and is collected in the tank.

The oil from miscella is separated by distillation and stripping under vacuum. Solvent extraction of cooked flakes can be done batch wise or continuously. In continuous extraction method, concurrent solvent flow is preferred. The usual load of oil in miscella is 20-25% oil by weight. The miscella is heated to 83°C in evaporators, steam is injected on the shell side to vaporize and reduce hexane to about 5% of the oil. Then the oil is directly steam stripped in a vacuum tower at temperature rising to a final 110°C.

Hexane

It is commonly used world over for extraction of oil from oilseeds. Considering its scale of use the following information would be useful. Some of the properties of Hexane are in liquid form it is 0.69g/ml, vapour density is 2.7 relative to air, flammable range by volume: 12-6.9%, flammable range by weight 3.4 - 18%. The ignition 247°C, flash point (-) 26°C, boiling point 69°C. The exposure to hexane has some long term and short term effects and accordingly the limits are decided.

Table 1. Health hazards of exposure to hexane

Concentration, ppm	Effect
50	Long term A.O.G.I.H 1985 recommended limit (American standard) No symptoms reported
500	Eye irritation, headache, nausea, blurred vision anorexia, sensory impairment etc.
5000	
2000	Short term No symptoms reported in 10 minutes
5000	Marked vertigo reported in 10 minutes
32000	Fatal to mice in 2 hours
64000	Fatal to mice in 5 minutes

Desolventizing i.e. removal and recovery of solvent which adheres to extracted flakes is another important operation when soybean protein is sought for commercial food uses such as fortification of wheat flour for bread, meat extenders, infant formula etc. It is important that a large percentage of the protein be water soluble. The meal is subjected to steaming for toasting of flakes to vaporize hexane with live steam. Direct contact of steam used for severe protein denaturation. However, realizing the need for use of high protein meal for food uses, recent approaches like flash desolventisation are adopted by progressive solvent extraction units. Flash desolventizers provide a means of controlling protein solubility while desolventizing extracted flakes. Extracted flakes are introduced into super heated solvent vapour (160 – 166°C) for a period of 1.5 – 3.0 seconds. The PDI of the flakes at collector will be within the range of 2 – 5% less than the PDI of whole soybeans if proper care has been taken during cracked bean conditioning.

Flakes entering the deodorizer will be stripped of traces of solvent using indirect heat from condensed steam in the deodorizer jacket. Flakes may yield 0.5% – 1%, by weight, of solvent during the deodorizing operation, and PDI may be reduced by up to 10%. The final product PDI is controlled in the flake stripper. Sparge steam may be added to minimize solvent loss and to produce low PDI products (PDI 50 - 65). The products of medium range (60 - 75) and high range (75 - 90) can be obtained by application of jacket steam, and stripper operation without steam, respectively. However, the solvent loss increases as the PDI of the end product increases. The typical ranges of solvent loss are: high PDI (0.5 - 1.2%), medium PDI (0.3 - 0.8%) and low PDI (0.25 - 0.5%). Flakes are typically conveyed from the flake stripper using a negative pressure air conveying system to flake storage, grinding or further processing. Use of antibacterial inlet filter to purify incoming air is essential to maintain the purity.

High PDI Soybean Meal

PDI (Protein Dispersability Index) is a relative measure of the amount of water soluble protein to total protein. Seed quality exerts major influence over the quality of available protein. Soybean handling, drying method and storage also plays an important role in deciding the soybean product quality. Use of screw conveyors and bucket elevators to transport cracked soybeans through finished meal products must be manufactured

in such a way that a chance for material build-up in the unit and growth of bacteria and mould is minimum. Material handling equipment and mould be equipped for such and frequent steam purging if high PDI product is desired.

Residual hexane

Residual hexane in deoiled meal is toxic and therefore undesirable. As per US standards a maximum of 50 ppm residual hexane in soybean meal is allowed while the set forth by the Bureau of Indian Standards is 175 ppm. The European Economic Community (EEC) has set a maximum limit of 1000 ppm of residual solvent limit for animal feeds.

Advantages and limitations

The solvent extraction method and a combination of prepress and solvent extraction method are capable of removing nearly all of the oil from oilseed meal or flakes, and residual oil contents of less than 1% are achievable. In addition to higher yield obtained by a more complete removal of oil, the residual meal has better preservation qualities and higher protein contents. The method is also suitable for oil seeds with lower oil content. However, some of the disadvantages related to this method are:

It involves solvents which are harmful to human health and are believed to have carcinogenic effects in the longterm. The solvent (Hexane) being highly inflammable poses the danger of fire. The method involves more costly and technically sophisticated equipment thus the initial capital and operating costs are high. The energy requirements of solvent extraction are high. In addition, quality of oil recovered by solvent extraction is lower than that of pressed oil.

Super-critical Fluid Extraction

A new method which is still on experimental scale and popularly known as supercritical CO_2 extraction method. In this method, CO_2 , when heated and compressed above its critical temperature and pressure serves as a solvent. It is non-toxic, nonexplosive, readily available and easily removed from the extracted product. The method is also a efficient as solvent extraction at removing triglycerides while yielding a high quality, gum free, light coloured crude oil.

The super critical fluid extraction (SFE) is a unique extraction process which embodies several features of conventional solvent extraction while at the same time having important features of its own. The SFE is mainly characterized by the following attributes:

- Relatively non-volatile hydrophobic materials can be dissolved by super critical fluids.
- The properties of the extraction medium can be varied within wide limits by means of pressure and temperature changes
- Separation of extracted substances from the critical fluid can be accomplished by altering the pressure and or the temperature of the fluid.

Acknowledgement

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Procuring Premixes ? Know These Facts !!

by
Kishore Shintre

Introduction

Procuring Ready-to-use premixes of micronutrients has been proved to be an economical, efficient and effective mode of a modern day materials manager, where he is supposed to hold his working capital under tight leash and is answerable to cost reduction on day-to-day basis and moreover his performance is appraised on the basis of Just-in Time (JIT) management of materials.

Of course, buying ready-to-use premix is like having an insurance coverage against market fluctuations in prices, shortages, delays and so on. This not only makes one's job easy in keeping track of various activities for each and every single raw material ingredients like negotiating, ordering, receiving maintaining inventory etc. but also makes the life of a production manager relatively simpler, as the premixes are available as per his own formula, the packs are designed as per his batch sizes and more over he gets an analytical certificate ensuring that the desired overages have been added to compensate for his process losses.

As an efficient purchase manager of a food processing company, you have negotiated the most competitive prices and terms for procurement of these premixes and now that you are rest assured that everything is in 'order' for you as per your order, till.....you come across the inevitable....THE QUALITY PROBLEM....!!!!

All your cost savings and efficiency in procuring the premix, then becomes a big question, when your final product starts showing undesirable organoleptic properties, foreign particles, impurities, insolubility, instability or your product fails on quality grounds either at your quality control or worst at the consumers' level and then starts the painful process of recalling your problem batch and getting unwanted negative publicity in the market apart from legal proceedings.

Therefore, dear friend, please ensure that your premix manufacturer has the following prerequisites with him, before you approve him as a vendor :

1. Technical Know-how: How well qualified, trained and experienced the technical personnel of the premix manufacturer is

essential for you to understand, so that they really understand your exact requirements technically and are able to provide you with technological solutions to your problems like process losses, calculation of overages required, suitability of various product forms, internal procedures like proper handling of each other, usage of specialized product forms and suggestions for improving your product quality, stability and overall shelf life.

2. ISO Certification: As your company is already accredited with and going to be accredited with ISO certification, it will be proper for you to procure the premixes also from an accredited ISO company, as they are already familiar with these procedures and therefore more compatible to deal with your requirements.

3. HACCP Certification: Make sure that you procure your premixes from a company that is committed to Total Quality Management and Good Manufacturing Practices. The vendor should have established his technical capabilities in exhibiting his concern for quality and hygiene. Ask for the HACCP certification, this ensures that the premix quality right from the raw material level to the finished goods form, goes through strict checks at various critical control points and that all the hazards are analyzed and eliminated.

4. Use of Permitted anti-oxidants and stabilizers: The premix manufacturer has to ensure that he uses only the permitted anti-oxidants and stabilizers in the premix meant for the particular food product as per PFA and hence is responsible for following the same strictly. E.g. BHT (Butylated Hydroxy Toluene) is not a permitted anti-oxidant in foods as per PFA.

5. 100 % vegetarian ingredients: As per the latest amendment to the PFA all the ingredients used in food products need to be 100 % vegetarian or else the food product need to be classified as " Non-vegetarian " on the label (with the brown circle and black square around it), he premix manufacturer has to ensure that all the ingredients used as 100 % vegetarian, as per the requirement of the food product being fortified.

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Studies & Standardization of Soyawadi & Moongwadi

by
Gyan P. Sharma* & P.K. Jaiswal

Abstract

Survey studies has been conducted on present status of quality of Soyawadi and Moongwadi available in the market. Quality parameters of these products has been suggested on the basis of the data collected widely from Regional Agmark Laboratories (RAL) located in different parts of the country, as no standard has been framed so far by PFA Act, 1954 or Bureau of Indian Standards for this commodity.

Introduction

Soyawadi and Moongwadi are traditional and popular food commodities. These commodities are commonly consumed as a cooked vegetable either alone or in combination with potato or other food stuffs like noodles, gobhi, non-vegetarian. These commodities may be prepared at home or at large scale in the cottage industries using husked Moongdal (*Vigna Radiata*) and defatted Soyaflour as a basic raw material.

The method of preparation is simple. In case of Moongwadi husked moongdal is soaked for few hours and wet ground in the grinder, keeping very high consistency of the batter, moisture content of the dough or batter is generally maintained between 20% to 25%. Now common salt, spices, or any other additive like antioxidants may be added and mixed. The dough is transformed into generally spherical shaped balls of desirable size or any other shape may be assigned to the product with the help of a die press. The product so obtained is dried in counter-current air oven in the industries or at home generally sun drying is preferred. Now the product is packed in airtight pouches, laminates and cartons to retain its freshness, taste and flavor.

In case of Soyawadi, the process is almost same but raw material used is defatted Soyaflour obtained from the solvent extracted Soya meals.

The use of solvent extracted edible grade Soya flour has potential in day-to-day Indian foods^(1,2). Its low starch content however, caused changes in sensory characteristics of the product. Soyaflour incorporated product⁽³⁾ with other foodstuff showed increased acceptability in the market. On account of this Soyawadi is prepared by mixing spices etc., with other food stuff to enhance the organoleptic characteristics and acceptability of the product. Moongwadi is also rich in good quality protein and its content is generally more than 20%. The organoleptic properties also become much better as compared to Moong dal as such.

In view of their popularity and demand in the market, it was considered worthwhile to survey the quality of the products available in the market and frame its quality standards. Literature survey revealed that no quality standard of this product has even been formulated by any of the standard framing organizations like BIS, PFA Act or others. Therefore, this project was undertaken at Central Agmark Laboratory, Nagpur and associated RALs for the purpose of formulating the quality standards and to bring this commodity under the purview of Agmark Certification Scheme.

Material & Methods

100 samples of Moongwadi and 114 samples of Soyawadi from different brands in packed condition were procured from various local markets and analyzed in respective RAL at Bhopal, Mumbai, Rajkot, Bangalore, Guntur and Central Agmark Laboratory, Nagpur for the various quality parameters viz. Moisture • Total ash • Acid • insoluble ash • Protein • Alcoholic acidity and Crude fiber using standard methodology⁽⁴⁻⁶⁾.

Results & Discussions

Data reveals (Table-I & II) that major portion of samples of Moongwadi and Soyawadi falls in the same range of 6% to 12% of the moisture content, which would cover about 86% of samples of Soyawadi and 80% of Moogwadi samples. As moisture content determines keeping quality of the product hence with a view to this end and from the observed data, moisture content of both the products may be considered in the same range i.e. 8% for adopting the limit of this parameter.

Table I

SOYAWADI

Parameter	Range of parameter	No. of samples	%Share
Moisture	5.0 – 8.0	31	27.19
	8.1 – 10.0	34	29.83
	10.1 – 12.0	35	30.70
	Rest	14	12.28
Total Ash	1.0 – 2.0	2	1.75
	2.1 – 4.0	4	3.50
	4.1 – 6.0	12	10.52
	6.1 – 8.0	79	69.30
	Rest	17	14.91
Acid Insoluble Ash	0.11 – 0.30	44	38.60
	0.31 – 0.50	16	14.03
	0.51 – 1.0	39	27.19
	Rest	23	20.18
Total Protein	Upto 30.00	10	8.77
	30.1 – 50.0	68	59.66
	50.1 – 60.0	34	29.83
	Rest	2	1.75
Crude Fibre	Upto 0.50	25	21.93
	0.51 – 1.00	59	51.76
	Above 1.00	30	26.32
Alcoholic Acidity	Upto 0.20	64	56.14
	0.21 – 0.40	46	40.35
	0.41 – 0.60	1	0.88
	Rest	3	2.63

In case of total ash (including common salt) Soyawadi about 87% of the samples are covered in the range of 5% to 9%. Rest of the samples showed extreme higher or lower values. The value of common salt varied less than 1% in all the samples studied. From the data of Soyawadi the value of 6% total ash (excluding the common salt) may be considered for adopting the standard of this parameter in the respect of Soyawadi.

Total ash of Moongwadi (excluding common salt) concorded comparatively lower range from 1.0% to 6.0% among the major sample (84). From the frequency of data, it seems appropriate to consider a maximum limit of 2.5% of total ash content of Moongwadi.

Acid insoluble ash content of both commodities varies in the same range i.e. 0.05% to 1.0% covering almost all the samples.

In case of protein content, Soyawadi shows higher range i.e. 40% to 60% while in Moongwadi samples the protein content varies from 20% to 30%. Among 100% of the samples, Crude

Parameter	Soyawadi		Moongwadi	
	Grade I	Grade II	Grade I	Grade II
Moisture	9.0	11.0	9.0	10.0
Total Ash	7.0	8.0	3.0	4.0
Acid insoluble Ash	0.30	0.50	0.20	0.50
Total Protein	50.0	45.0	26.0	22.0
Crude Fibre	0.50	1.00	0.50	1.50
Alcoholic Acidity	0.15	0.20	0.20	0.30

*Author for Correspondence, Central Agmark Laboratory, North Ambazari Road, Nagpur

Table II

Parameter	Range of parameter	No. of samples	% Share
Moisture	5.0 – 8.0	19	19
	8.1 – 10.0	38	38
	10.1 – 12.0	29	29
	Rest	14	14
Total Ash	1.0 – 2.0	21	21
	2.1 – 4.0	49	49
	4.1 – 6.0	14	14
	Rest	16	16
Acid Insoluble Ash	0.1 – 0.30	38	38
	0.31 – 0.50	17	17
	0.51 – 1.00	22	22
	Rest	23	23
Protein	Upto 20	2	2.70
	20.1 – 30.0	69	93.29
	30.1 – 50.0	3	4.05
	Rest		
Crude Fibre	Upto 0.50	30	30
	0.51 – 1.5	49	49
	1.51 – 2.5	21	21
	Rest	7	7
Alcoholic Acidity	Upto 0.2	18	18
	0.21 – 0.40	48	48
	0.41 – 0.60	27	27
	Rest		
Sodium Chloride	Upto 1.0	59	59.59
	1.1 – 2.0	22	22.22
	2.1 – 5.0	16	16.16
	Rest	2	2.02

fiber content of Moongwadi was upto 2.5% in all the samples but a lower content i.e. upto 1.5% was observed in the 100% samples of Soyawadi.

Alcoholic acidity was found to vary from 0.2% to 0.6% among the major samples (75%) of Moongwadi, while the opposite trend was observed in Soyawadi in which almost 97% of the samples are covered under 0.4% of the alcoholic acidity.

A rational appraisal of the results of the present study conclusively infers that following standard might be adopted for grading the quality of the Soyawadi and Moongwadi. Apart from the above food safety parameters as per P.F.A. Act requirements may be incorporated in the standards.

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Procuring Premixes? ...

5. Premix Raw Material procurement: As a food manufacturer, you should have access to all the raw material QC records of our premix manufacturer to make sure that he has used all the materials as per your required quality standards and not using substandard (animal feed grade or technical grade) materials in your food grade premix. It may be likely that, in order to save on costs the premix manufacturer has used raw materials that are close to expiry date, which are procured from the market at discounted price. Also if you are buying a premix from a manufacturer, make sure that his date of manufacturing the

premix is the latest and he does not supply you with an old batch of premix.

7. Quality Assurance: Ensure that his laboratory has all the modern analytical instruments that are in working condition and have been calibrated and serviced regularly. You may ask for all the certificates of analysis of the materials used by him in your product as well as the test report of the premix being supplied to you.

8. Microbiological Quality control: Some premixes require the use of natural carriers like sugar, maize starch, wheat gluten, arachis oil etc. and therefore it is essential that your premix contains all the carriers having certificates of analysis of microbiological contamination. You should also ask for the microbiological certificate of analysis, so that you have ensured no contamination in your product.

9. Audit and Inspection of premises: You also need to visit his manufacturing facilities and audit the premises, including the raw material stores to make sure that all the material used has been passed by the QC and kept separately.

All the manufacturing facilities like sifters, mixers and packing materials are kept in spic and span condition and have hygiene control at all points including worker's changing rooms, toilets, passages, entry and exit points.

10. Balances and Weighing machines: Do ask for calibration records of all the weighing machines, as any fault in the balances may have wrong addition levels of micronutrients. Make sure that digital electronic balances are in place from reputed companies.

11. Batch manufacturing records: As the premix is being manufactured for you, you are entitled to check all the manufacturing records of the premixes including all the test reports of the final premixes should be available for inspection during your visit.

12. Records of rejected materials: It is very important to check how the records of the rejected materials are kept and ensure that none of the rejected lots have been used up again in any of your products. As per GMP all the rejected raw materials should have been returned to the supplier or destroyed forthwith.

13. Packing materials: Not to miss the important point that all the primary packing materials used are made up of virgin materials and food grade materials as the premix will be in contact with the same. It is needless to mention that, not all the recycled plastic based containers can be considered as harmless. It is necessary that enough care is taken in flushing Nitrogen in each pack, so that the Oxygen is removed from the pack before sealing and hence stability of the product is maintained.

14. Storage of Premixes: It should be ensured that the final product form of the premixes are well packed, sealed and stored under appropriate storage conditions prior to the despatch to your factory. The premix requires temperature below 20 C and in cool and dry place away from direct sunlight.

15. Pest Control measures: Please also ensure that the premix manufacturing premises are regularly undergoing pest control measures and all the records are maintained about the details of previous pest control activity.

It is very important dear friends, that you should follow the above 15 point guidelines and make it a point to visit your vendor before you finalize your order on your premix manufacturer and verify the above suggested measures, and make it a regular practice of giving surprise visits and keep checks on his activities and make sure that all the décor is not only meant for your visit which was announced to him earlier, but also that they follow all those measures regularly.

The premixes you are going to procure are going to be used in your food products and therefore you should make sure from all angles that what you are paying for is really worth its while.

Effect of Packaging and Storage on Quality of Dehydrated Spinach Beet (Palak)

by
M.M. Jorwar and P.A. Unde

Abstract

The effect of packaging materials (cardboard box, brown paper bag and polyethylene bag) and storage period (6 months) on moisture content, ascorbic acid, ash content and organoleptic properties of spinach beet was studied. The quality and stability of dehydrated products was assessed during storage. The moisture content increased with the storage period. Increase in moisture was found minimum (2.20%) in case of 400 gauge polyethylene bag and maximum in case of cardboard box (10.61%). There was minimum loss in ascorbic loss in ascorbic acid and ash content of 5.17 mg/100 g and 3.5%, respectively in case of polyethylene bag (400 gauge). Whereas maximum loss of ascorbic acid (9.81 mg/100 g) and ash content (5.5%) were observed in cardboard box. Dehydrated spinach beet packed in 300 and 400 gauge polyethylene bag could be stored for 6 months at room temperature. Dehydrated spinach beet products prepared by using cold and hot brining treatments were found to be more stable products.

Introduction

Spinach beet (palak) is one of the most common leafy vegetables of the tropical and subtropical region and is grown widely in India. It is highly nutritious and available at cheaper rate in the market as compared to other vegetables. It is important source vitamin A, ascorbic acid, iron and calcium as compared to other vegetables. It has some medical properties, because the herbaceous part of palak is mildly laxative. Hundred grams of spinach beet leaves supply equivalent essential amino acids of any non-vegetarian food like meat and fish (Bose and Som, 1986). The composition of spinach beet per 100g edible portions is 86.4g water, 6.59g carbohydrates, 30mg phosphorous, 0.56mg riboflavin, 380mg thiamin, 19770 I.U. vitamin A, 3.3mg nictanic acid, 70mg vitamin C (Veeraraghavathatham *et al.*, 1994).

Product packaging provides the optimum properties for its anticipated shelf life. Packaging preserves the quality and nutritive value of dehydrated food by exclusion of oxygen and control of moisture loss or gain (Leonard, 1987). Proper packaging of dehydrated vegetable products to prevent deterioration and spoilage during storage under ordinary conditions as well as under extraordinary adverse conditions is an important problem. Dehydrated vegetables should be quite dry and should be packed in moisture proof containers. If care is not taken to guard against entry of excessive moisture, the content inside the packing becomes mouldy resulting in loss of quality regarding of colour, texture, taste and flavour. Resistance to water vapour permeability and freedom from undesirable flavours is important consideration in the choice of suitable packaging materials. Therefore, packaging of dehydrated vegetables becomes highly critical and decisive.

The storage stability of dehydrated vegetables is affected by many factors: temperatures, humidity, light, packaging materials, micro-organisms and trace elements etc. The dehydrated products should be protected as much as possible from these adverse conditions so that their quality can be maintained. Dehydrated vegetables, however, lost some of their popularity and flavour during storage and distribution (Gridhari Lal *et al.*, 1986). Therefore, a storage study on dehydrated products is

important in the view of stability of the products.

Although a lot of work is done on dehydration of leafy vegetables, a very limited work is reported on the stability of dehydration vegetable products during storage. In view of these, the present research work was undertaken.

Materials and Methods

The flow chart of experimental work plan is shown in Fig.1.

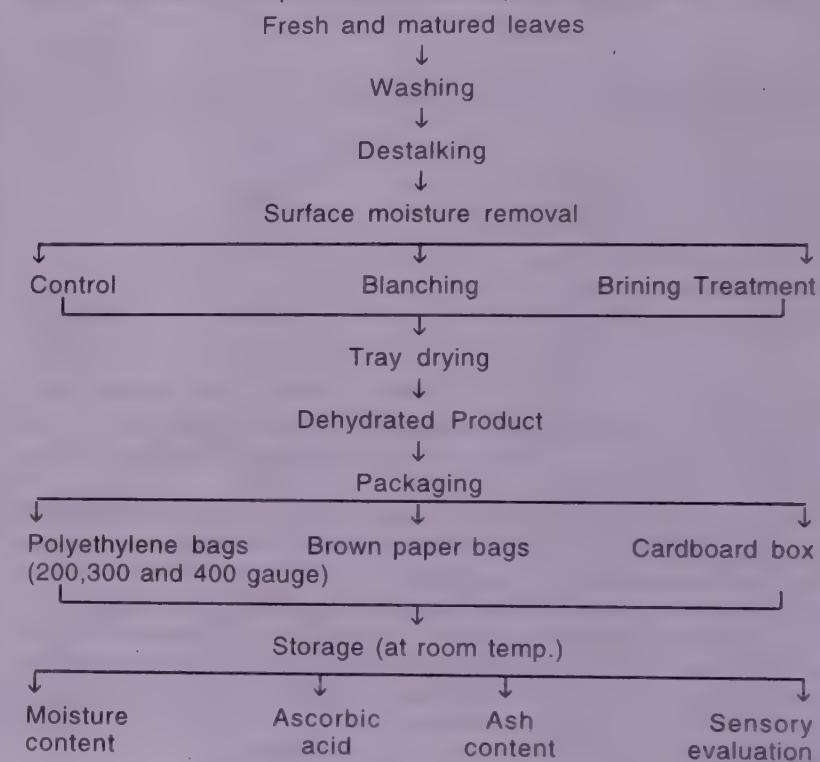


Fig. 1. Flow Chart of the experimental work plan

Sample preparation: Fresh, fully matured disease free spinach beet (cv. Local) was taken for the experiments. Destalking was done manually. Hand washing was done to remove the contaminants like dirt, sand, mud etc. Surface moisture of destalked samples were removed by putting them on blotting paper and kept under air circulation for 15 min. Blanching was done at 80°C for 3.5 (Kalra, 1990). Blanched samples were soaked in cold water for separating individual leaves and then put on dry cloth and excess water was drained off. The treatment without blanching and brining was taken as control. The prepared samples were treated in brine solution. The brine solution was prepared by dissolving required quantity of sodium chloride (w/v) in distilled water. 0.1% NaHCO₃ + 0.01% NaMS was added in the brine solution to maintain the colour and texture of the products.

Cold Brining: The blanched samples were dipped in the solution of different brine concentrations (5, 10, and 15%). These samples were treated for 30, 60 and 90 min. The brine to sample ratio was 2:1 (v/w). The samples were then removed and excess brine was drained off. Then osmotically treated samples were further dried using tray dryer to achieve the final moisture content in the range of 3 - 6%.

Hot Brining: The hot brining treatment was given by using concentrations of 5, 10, 15% at 60°, 70°, 80°C for 20, 30, 40 min. The brine to sample ratio of 2:1 (v/w) was taken. The treated samples were then removed and excess brine was drained off. The osmotically treated samples were further dried in a tray dryer at 60°C for 2.5 to 3 hr.

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Packaging of Dehydrated Products: The dehydrated products were packed in five different packaging materials viz., cardboard box (P_1), brown paper bag (P_2), polyethylene bag 200 gauge (P_3), polyethylene bag 300 gauge (P_4) and polyethylene bag 400 gauge (P_5). The cardboard box of size $20 \times 15 \times 5 \text{ cm}^3$ with capacity of $80 - 100\text{g}$ was taken. The size of brown paper bag was $40 \times 20 \text{ cm}^2$ of $140 \mu\text{m}$ thickness. The size of polyethylene bag was $35 \times 25 \text{ cm}^2$. The thickness of polyethylene bags was 200 gauge ($50 \mu\text{m}$), 300 gauge ($75 \mu\text{m}$) and 400 gauge ($100 \mu\text{m}$). The packaged products were further stored for 6 months at room temperature ($27 \pm 2^\circ\text{C}$).

Storage of Dehydrated Products: The dehydrated products packaged in various packaging materials were stored at room temperature for a period of 6 months. The samples were analyzed for its moisture content, ascorbic acid, ash content and organoleptic properties after every months of storage. The moisture content was determined by standard oven method. The ascorbic acid was estimated by 2,6-dichlorophenol indophenol-dye method given by AOAC (1975). Ash content was determined by using standard method given by AOAC (1975).

Results and discussion

Packaging of Dehydrated Products: The dehydrated products of spinach beet were prepared by using control, blanching, cold and hot brining treatments. These samples were further packed in cardboard box (P_1), brown paper bag (P_2), 200 gauge polyethylene bag (P_3), 300 gauge polyethylene bag (P_4) and 400 gauge polyethylene bag (P_5). The effect of these packaging materials on quality of dehydrated products with respect to storage period was studied. The products were stored for six months at room temperature ($27 \pm 2^\circ\text{C}$). The effect of packaging and storage on overall acceptability of spinach beet products was studied. The effect of packaging material (P_1 to P_5) and storage period (1 to 6 months) on moisture content, ascorbic acid and ash content was studied.

Storage of Dehydrated Products: The dehydrated were stored for six months in five different packaging materials. The effect of storage period and packaging material on quality of stored products viz., moisture content, ascorbic acid, ash content and overall acceptability was studied.

Moisture content: The effect of storage period and packaging on moisture content of is plotted and shown in Fig. 2. Figure shows that the moisture content increased with the storage period for all the packaging materials. The gain of moisture content might be due to moisture absorption from the atmosphere by the products during storage. Similar trend was observed by Sagar *et al.*, (1998). The maximum increase in moisture content was seen in cardboard box followed by brown paper bag. Whereas minimum increase in moisture content was seen in polyethylene bag (400 gauge).

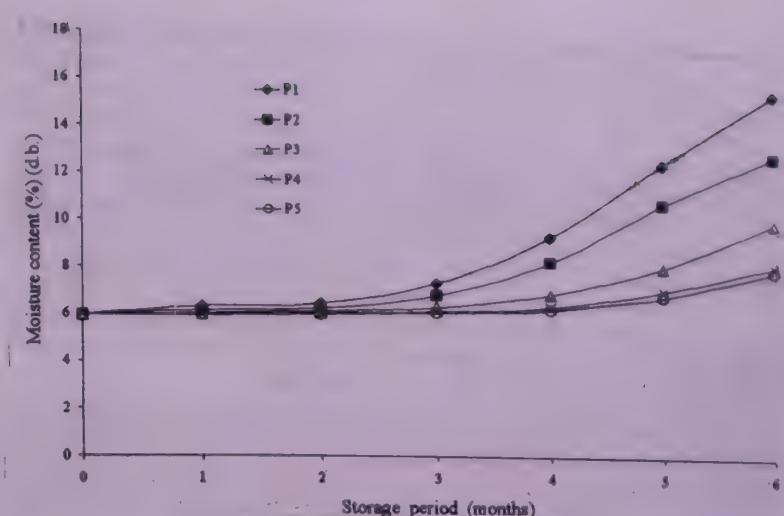


Fig. 2. Effect of Storage period and packaging on moisture content

For 6 months storage, maximum increase in moisture content was found in packaging P_1 (10.61%, d.b.) followed by P_2 (7.89%, d.b.) and P_3 (4.91%, d.b.). Whereas minimum increase in moisture content was found in packaging P_4 (2.58%, d.b.) and (2.20%, d.b.). The dehydrated products could be stored safely in polyethylene bags of 300 and 400 gauge for 6 months. This might be due to the fact that there is less water vapour transmission rate through 300 and 400 gauge polyethylene compared with other packaging materials.

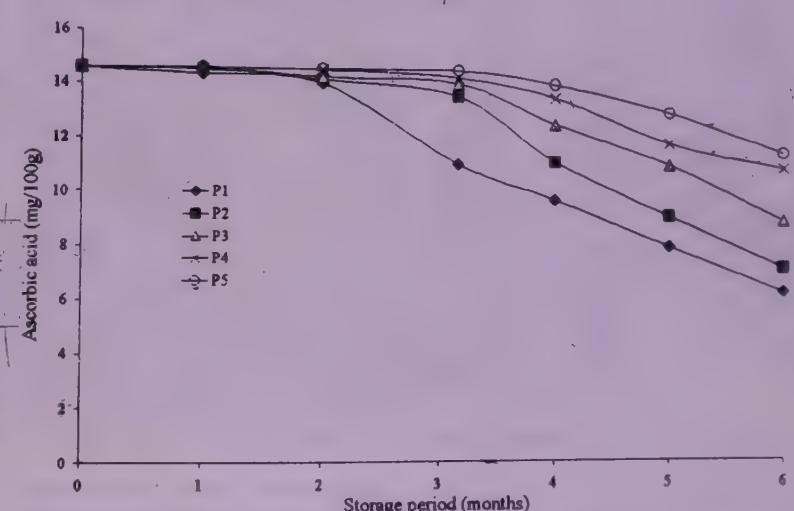


Fig. 3. Effect of storage period and packaging on ascorbic acid.

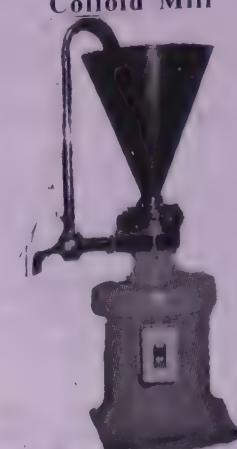
Ascorbic acid: The effect of storage period and packaging on ascorbic acid is plotted and shown in Fig. 3. From Fig. 3, it is

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seen that the ascorbic acid was decreased with storage period in different packaging materials. It might be due to oxidation during storage. Labuza (1973) found similar results. The maximum loss of ascorbic acid was found in cardboard box. Followed by brown bag and minimum loss was occurred in polyethylene bag (400 guage) for all the products.

For 6 months storage, loss in ascorbic acid was found maximum in packaging P_1 (9.81 mg / 100 g) followed by P_2 (8.95 mg / 100 g) and P_3 (7.67 mg / 100 g). Whereas minimum loss in ascorbic acid was found in packaging P_4 (5.56 mg / 100 g) and P_5 (5.17 mg / 100 g). The quality (minimum loss of ascorbic acid) of dehydrated products was found better in case of P_4 and P_5 compared with other packaging materials.

Ash content: The effect of storage period and packaging on ash content is plotted and shown in Fig. 4. It is seen that ash content decreased with storage period in all the packaging materials (Fig. 4). This might be due to change in oxygen and moisture gained during storage. The similar results were given by Mizrahi *et al.*, (1970). The maximum loss of ash content was found in cardboard box followed by brown paper bag. Whereas minimum loss was occurred in polyethylene bag (400 gauge) for all the products.

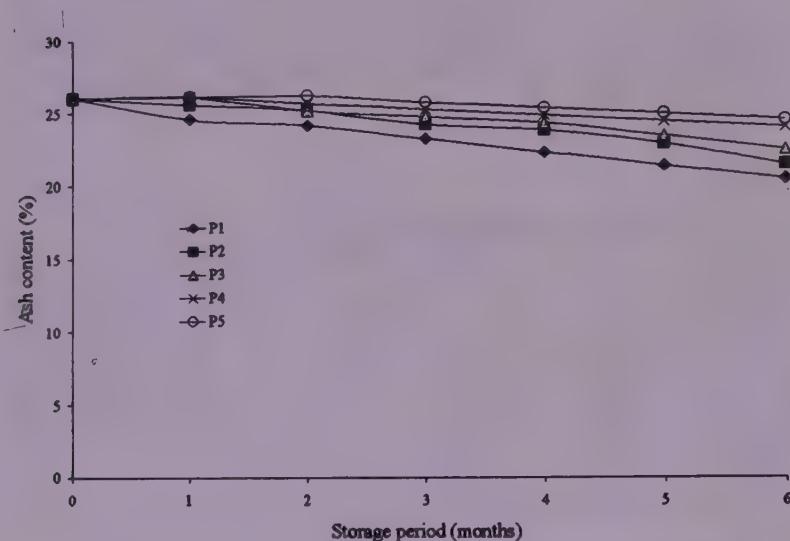


Fig. 4. Effect of Storage period and packaging on ash content

For 6 months storage, loss in ash content was found maximum in packaging P_1 (5.5 %) and P_2 (4.5 %) and P_3 (3.5 %). Whereas loss in ash content was found minimum in case of packaging P_4 (3.0 %) and P_5 (3.0 %). The quality (minimum loss of ash content) of dehydrated products was found better in case of P_4 and P_5 compared with other packaging materials after six months storage. It is in confirmation with the results on quality of the products (ascorbic acid.)

Sensory evaluation: The data of packaging on overall acceptability of dehydrated products stored for 6 months is given in Table 1.

The overall acceptability of dehydrated products stored in polyethylene bag of 400 gauge (P_5) and 300 gauge (P_4) was

Table 1: Effect of packaging on overall acceptability of dehydrated products (stored for 6 months)

Treatment	Product	Before storage	Packaging material				
			P_1	P_2	P_3	P_4	P_5
Control	D_{P1}	6.8	4.0	5.5	5.6	5.7	5.7
Blanching	D_{P2}	8.2	6.3	6.6	7.0	7.1	7.1
CBT, 5%	D_{P3}	7.9	6.3	6.5	6.8	7.0	7.1
CBT, 10%	D_{P4}	7.8	5.9	6.3	6.6	6.9	7.1
CBT, 15%	D_{P5}	7.6	5.8	5.9	6.2	6.4	7.1
HBT, 5%	D_{P6}	8.6	6.8	7.0	7.2	7.5	7.9
HBT, 10%	D_{P7}	8.4	6.5	6.8	7.0	7.2	7.5
HBT, 15%	D_{P8}	8.0	6.0	6.3	6.6	6.9	7.0

CBT = Cold brining treatment for 30 min

HBT = Hot brining treatment at 60°C for 20 min

found maximum (5.7 – 7.9) for all products followed by polyethylene bag 200 gauge (P_3) and brown paper bag (5.5 – 7.2). The minimum overall acceptability was observed in cardboard box (P_1) (4.8 – 6.8). The colour, texture and flavour score were maximum in case of 400 gauge polyethylene bag (P_5) and 300 gauge polyethylene bag (P_4). This might be due to maximum retention of colour, texture and flavour in thick polyethylene bags (75 to 100 μ m) compared with other packaging materials. The maximum retention of colour, texture and flavour is due to less water vapour transmission rate through thick polyethylene bags (> 300 gauge).

The overall acceptability was found maximum (7.0 – 7.9) for dehydrated products prepared using hot brine treated products (D_{P6} , D_{P7} , D_{P8}) followed by cold brine treated products (D_{P3} , D_{P4} , D_{P5}) with overall acceptability between 6.6 to 7.1. The overall acceptability was found minimum in control (D_{P1}). The overall acceptability was maximum (7.9) for the product (D_{P6}) prepared by using hot brining treatment (C = 5 %, T = 60°C and t = 20 min) storage for 6 months in 400 gauge polyethylene bag.

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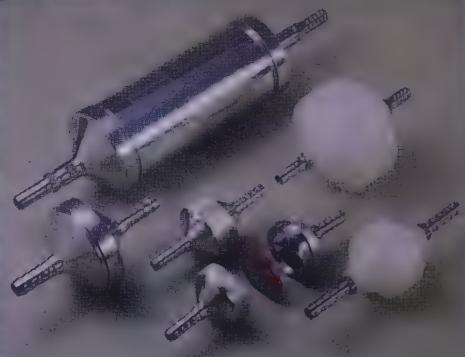
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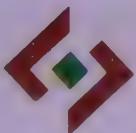
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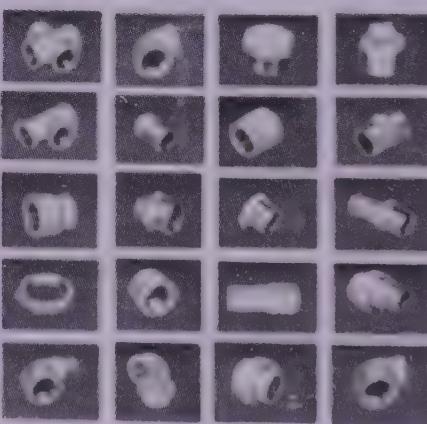
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COMPANY NEWS

PERNOD RICARD

French Liquor major Pernod Ricard has decided to acquire the business of Seagram International in India.

Seagram India's product portfolio includes Royal Stag, 100 Pipers, Something Special, Imperial Blue, Blender's Pride (all whiskey brands) and Seagram's Extra Dry Gin. It also imports and sells Chivas Regal Scotch. Pernod Ricard, on the other hand, sells only Tilsbury rum in India. The acquisition of Seagram India business will, therefore, extend the French liquor firm's business profile in India to the whiskey and gin segments.

Both Seagram and Pernod Ricard originally had received government permission to manufacture and distribute alcoholic products and manufacture and process fruit-based products and fruit juices. Seagram's fruit juice business was taken over by Pepsi which sells the Tropicana fruit juices through another subsidiary.

Pernod Ricard's worldwide non-alcoholic drinks portfolio includes several fruit juice brands and the Yoo-Hoo chocolate drink. The joint venture partner of Pernod Ricard SA Diageo's Indian arm UDV will, however, remain an independent entity, though in the division of brands worldwide, UDV has got Captain Morgan rum, Crown Royal and VO Canadian whiskies, 7 Crown American whiskey and the Sterling Vineyards wine business from the Seagram's drinks portfolio.

GCMMF (AMUL)

Gujarat Cooperative Milk Marketing Federation (GCMMF) through its brand Amul has decided to launch fat free and sugar free ice creams which will be a boon for the niche segment of consumers who keep off ice creams for fear of adding extra kilos or from fear of diabetes.

Besides fat-free and sugar-free ice-creams, GCMMF is entering softy marketing in a big way. It has already started selling its softy icecream, called "Snowcap Softy", in a few outlets in Gujarat and Mumbai.

The softy market is estimated to be around Rs 100 crore. GCMMF has de-

cided to position its softy as a multiple-use product. Besides marketing it to the retailers who will sell it as softy cones, they are targetting consumers directly. People can use it to make milk shake.

To maintain the quality and consistency of 'Softy' GCMMF had decided to launch the softy in ultra heat-treated (UHT) tetrapack packaging with ready to eat flavours. It will be available in one-litre packs with a shelf-life of three months. It can be kept at room temperature and poured into a softy machine before selling it to consumers. In all, GCMMF will launch its softy in 16 flavours, but will give five in tetrapack. The one litre pack is

sizes; in 200 ml and one litre.

Amul also hopes to enhance its share in the Rs 100 crore condensed milk market through the recent expansion of its production capacity. The production capacity of its Amul Mithai Mate i.e. condensed milk has increased from 10 tonnes per day to 25 tonnes per day. It has a continuous condensing plant at Mehsana. Amul Mithai Mate is priced at Rs 36 for 400 gm net weight tin.

SAGAR FOOD HOME

Battle is raging in the Delhi High Court between Sagar Food Home (Plaintiff) and Hotel Sukh Sagar (defendant) for trade mark "Sagar".

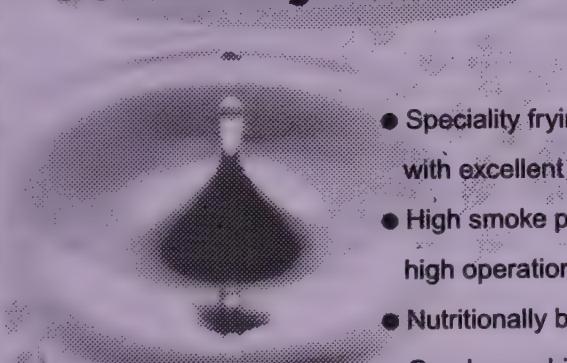
Sagar Food Home, has been serving south Indian food through various outlets in Delhi and Karnataka under the names of Sagar Food Home, Sagar Ratna and Sagar since 1980.

Counsel for Sagar, submitted before Justice VS Agarwal that the plaintiff has been using the trade mark, "Sagar", exclusively and continuously and has earned a good name and reputation for itself. He further submitted that in a similar suit, Justice SK Mahajan of the Delhi High Court had restrained the proprietor of 'Sai Sagar', a south Indian restaurant, from using that name as it was deceptively similar to the trade names used by Sagar Food Home. Sagar Food Home in the present case, became aware of the existence of Hotel Sukh Sagar, during May 2001. Singh submitted that the defendant had adopted a trade name that was deceptively similar to Sagar and was also in relation to the same line of business.

It was alleged that the defendant, by using a deceptively similar trade mark, had infringed the rights of the plaintiff. This has also caused utter confusion among the public. The plaintiff asserted that the defendant had adopted the trade mark, Sukh Sagar, with a view to take advantage of the goodwill and reputation of Sagar, and also to pass off its food as that prepared by Sagar. It was further submitted that Sagar Food Home had suffered damage to its good will and repu-

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priced at Rs 47. The Rs 2,258 crore Gujarat Co-operative Milk Marketing Federation (GCMMF), owners of Amul brand is also planning to launch flavoured milk in tetrapack to capture this segment.

To begin with, Amul is launching chocolate flavoured milk, to be called Amul Chocolate Milk. It will be available in two

tation and was likely to suffer more if Sukh Sagar was not restrained from carrying on its business under the said name. After hearing the argument the Delhi High Court passed an interim order restraining Hotel Sukh Sagar from carrying business under the trade name 'Sukh Sagar'.

NATIONAL DAIRY DEVELOPMENT BOARD

The National Dairy Development Board (NDDB) has merged Delhi's Mother Dairy and its fruits and vegetable project "SAFAL" into a single unit called Mother Dairy Fruit & Vegetable Co. Ltd. wholly owned by NDDB.

NDDB's edible oil project that markets the DHARA brand of cooking oils has also been registered as a public limited company to be known as Dhara Vegetable Oil and Foods Company.

Besides, NDDB has established 17 state offices to assist the milk cooperative in becoming more vibrant and competitive in Ahmedabad, Bhopal, Cuttack, Erode, Ernakulam, Hubli, Jaipur, Jodhpur, Kalyani, Kanpur, Ludhiana, Mysore, Noida, Patna, Pune, Rohtak and Vijaywada.

The total number of organised dairy cooperative village societies in the country has gone up to 96,000 with a membership of over 10.6 million farm families. Milk procurement has touched 16.5 million kg a day and milk marketing a record 13.36 million litres a day, on annual average basis, the report points out.

According to the NDDB annual report for 2000-01 the Board's turnover during the year stood at Rs 565.59 crore. The total income during the year exceeded the expenditure by Rs. 99.7 crore.

NDDB is endeavouring to diversify its product base by including indigenous sweets in its product list. It has provided technology for the manufacture of long life "paneer" to the Mandi Dairy Plant in Himachal Pradesh and standardised the manufacturing process for "Chhana poda", a sweet popular in Orissa.

A complete "Khoa" making line has been installed at Sabar Dairy, Himatnagar (Gujarat). A move is under way to install a similar line at the Mother Dairy, Delhi.

Fermented dairy products, such as "Dahi" and "Mishti Doi" are also added to the Delhi's Mother Dairy product line.

SHAW WALLACE

Manu Chhabria, promoter of Shaw Wallace has set up Rs 100 crore for expansion of its breweries division which includes setting up breweries in Kerala, Madhya Pradesh, West Bengal and Karnataka.

Among the new breweries being set up, the first off the block will be Malabar Brewery in Kerala. Located in the Thrissur district, this brewery is expected to start production by the end of the current fiscal.

Initially, the brewery will produce one lakh cases (of 12 bottles each) per month, which will subsequently be increased to two lakh cases. Being put up at a cost of Rs 20 crore, it is being funded equally out of debt and the promoter's contribution plus internal accruals.

The Kerala market is currently being serviced by Shaw Wallace out of its SICA Breweries in Pondicherry. The company is able to send only 25,000 cases per month from this brewery to Kerala where there is a demand for some three million cases per annum.

By the end of the current financial year, Shaw Wallace hopes to improve its volumes in the state as the new brewery starts production.

The company also expects its best-selling Royal Challenge Premium lager beer to become available at a discount of Rs 5-8 per bottle over the current price once Malabar Brewery goes on stream. Kerala is essentially a mild beer market and Royal Challenge with an alcoholic content of 4.2 - 4.5 percent meets the expectations of the consumers in the state.

Work started on another brewery at Jabalpur, in Madhya Pradesh. In addition, the company will come out with new labels, bottles and cartons - a total repackaging across the board. Shaw Wallace is the largest player in the fast-growing strong beer segment with brands such as Haywards 2000 and Haywards 5000. It also sells Lal Toofan beer in the UK and has drawn up plans to launch its Kohinoor brand in the US.

LT OVERSEAS LTD.

LT Overseas Ltd. promoter of the "Dawaat" brand of basmati rice in India will soon launch its ready-to-cook flavoured rice for the Indian consumers in the next financial year. The rice will be launched in five flavours - lemon, masala, methi, tomato and biryani. These will be available in 250 gm packs priced at Rs 18. The flavours will be in the form of dry powder which can be mixed with the rice while cooking, something on the lines of Maggi noodles.

Daawat is exported to 40 countries including USA, Canada, Australia and New Zealand among others. The company claims that it currently enjoys a 17 percent share in the domestic branded basmati rice market in India but is aiming for a 25 percent share. In value terms it is targeting to become a Rs 160 crore company in the domestic market by 2005, up from Rs 80 crore.

PEPSICO BEVERAGES INTERNATIONAL

Pepsico Beverages International has recently introduced a new variant to its Tropicana juice kitty with the launch of Mixed Fruit. The new variant contains five

different fruits - apple, pineapple, orange, mango puree and guava puree. Priced at Rs 68 for a litre and Rs 15 for 200 ml, the company claims that the flavour is especially made to suit the Indian taste buds.

PEPSI BOTTLING GROUP

Pepsi Bottling Group raised its estimates for full-year earnings as sales of its US bottled water and non-cola drinks brands are growing faster than expected.

The upbeat earnings report underscores the growing significance of non-cola brands in the soft drink system. Particularly in the US, sales of colas have lagged far behind other products such as high-energy juices and teas, gourmet coffees and sports drinks.

In August, PepsiCo succeeded in acquiring Quaker Oats' which owns the powerful Gatorade sports drink brand.

The bottler is helping unveil three new products in the fourth quarter, only one of which is cola-related, "Pepsi Twist", a lemon-flavoured version of the classic Pepsi. The other two are Diet Sierra Mist, a lemon-lime soft drink, and a different packaged Code Red in a cherry flavoured version of its citrus soft drink for take home use.

LEVER GIST BROCADES

Lever Gist Brocades, the 50:50 joint venture between Hindustan Lever Ltd (HLL) and The Netherlands-based Gist Brocades International, has closed down its India operations.

HLL had joined hands with the Dutch firm in 1997 for manufacturing fresh and instant dry yeasts in the country.

In December 1998, the joint venture had commissioned its 8,000 tonne per annum instant yeast plant at Chiplun which is now shut.

Gist Brocades International is among the largest producers of baker's yeast, penicillin and its derivatives and enzymes.

The venture was aimed at producing some of these products with technology obtained from Gist Brocades.

The joint venture was to have availed of the distribution reach of HLL's professional marketing group for a fee, which would have had equalled the royalty paid to Gist Brocades International for the supply of technology. This was to have synergies with HLL's own bakery fat businesses.

Incidentally, HLL has now acquired Modern Foods and is a major player in the bread market.

PILLSBURY

US Pillsbury a part of the \$ 21-bn global food and drinks giant Diageo, is finally parting the Godrej group after four years of alliance.

Pillsbury, is buying out the 43.5 percent equity stake of Godrej group in their joint venture Godrej Pillsbury. The stake acquisition will help Pillsbury increase its stake in the venture from the existing 56.5 percent to 100 percent, thus converting it to a wholly-owned subsidiary.

Pillsbury holds a stake in Godrej Pillsbury, a marketing joint venture, through Selvic Netherlands BV. The venture currently markets wheat flour brand Pillsbury Chakki Fresh Atta, Green Giant canned corn and Pillsbury cake mixes. Besides, the JV, set up in '96-97, was originally marketing four of the major brands from the Godrej Food stable - Jumpin' fruit juices, Cooklite Oil, Godrej Sunflower Oil and Shakti.

DUPONT'S

The \$30-bn world leading science company Dupont's business venture Dupont Protein Technologies International has developed a new soya protein additive called SolaeTM. SolaeTM is used by leading nutrition and food products companies world over. At present the company seeks to provide the Indian market with imported SolaeTM. Later they may set up manufacturing facilities here depending on the growth of the market since such a venture will involve investment of \$70-120 million.

Solae isolated protein provides the most reliable way to achieve an optimal level of soy protein with naturally occurring bioactive components.

Scientists believe that the bioactive components found in soy, including the isoflavours - natural plant components - are partly responsible for the health benefits soy products. Consuming a minimum of 25 grams of soy protein per day as part of a low cholesterol diet may play a role in reducing the risk of heart disease,

according to a health claim based on their research and approved by the US Food and Drug Administration (USFDA).

It is particularly important for a country like India where over a million people suffer from coronary heart disease and thousands die because of it each year. Worldwide, several leading nutrition and food products companies have switched to SolaeTM.

SOUTH AFRICAN BREWERIES

International liquor major South African Breweries (SAB) the fourth largest brewery company in the world with a market capitalisation of \$6 million is exploring the possibility of launching beer-like alcoholic fruit beverages in India. Alcoholic fruit chinks is a new concept to Indians. Alcoholic fruit beverages contain mild alcohol and is similar to carbonated fruit drinks.

The company is planning to launch its global brands in this category, which includes Redds, Solantis.

As part of its expansion plans, SAB will be also launching its global beer brand Castle Lager targeted at the premium segment. It recently introduced its first international beer brand Three Lions in the market.

At the national level, the company will be focusing on brands such as Knockout, Three Lions and Castle. Knockout, came under its fold following the takeover of Bangalore-based Mysore Breweries.

Mysore Breweries' other brands include Bengal Lager, Pals, Seven Star, Palisades and MBL Lager which will remain as a regional player in the south. On the other hand, the takeover of Narang Breweries gave the company two other local beer brands Continental and Tipsy 10,000, which has a strong presence in the north.

SAB's main objective is to make strategic investments in India's breweries sector which is a fast growing market and which offers substantial opportunities for future expansion. India, which has a population of over one billion and low per capita beer consumption, offers significant growth potential.

SAB has three breweries in Aurangabad, Bangalore and Uttar Pradesh and will be setting up a fourth unit in Andhra Pradesh, the fastest growing beer market. It will invest around Rs 50 crore and will have a capacity of 2 lakh hectolitre. SAB is also close to acquiring Rochees Breweries in Rajasthan. This acquisition will help SAB to add another one lakh case capacity to its already existing 6 lakh cases capacity in India.

VADILAL INDUSTRIES

Vadilal Industries, the owner of ice-cream brand 'Vadilal', is reviving its once-popular 'Happinezz' parlours and positioning them as premium ice-cream outlets across the country.

The ice-cream market has separate segments like low priced ice-creams, softies and premium segments, hence, it is easier to position it as a brand now.

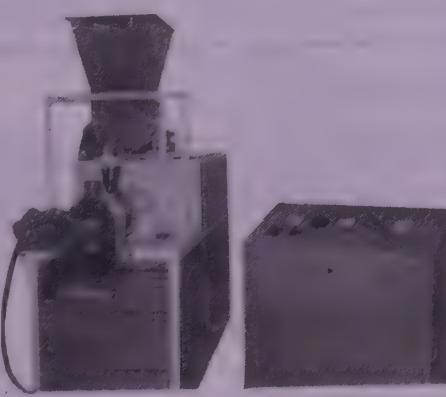
This comes after the launch of several premium ice-cream brands in the Indian market, which include Movenpick of Switzerland and Blue Bunny of US. Even HLL has launched a new premium range of ice-creams.

The company plans to increase the number of 'Happinezz' outlets, more to create a brand name for itself. The parlours will serve as platforms to test market new flavours.

Moreover, the company wants to use 'Happinezz' as outlets which will provide the entire range of ice-creams from its basket. It has about 70 to 80 flavours.

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COCO-COLA INDIA

Coco-Cola India is all set to launch its global energy drink "Shock" in India. It will be available in 250 ml glass bottles and will be priced around Rs 30. The energy drink is known for its rejuvenating properties as it consists of herbs like guarana and ginseng known for providing energy. However, health experts in some international newspapers have been quoted as saying that an over-dose of health drinks containing the above-mentioned ingredients could be harmful to some.

Herbs such as ginseng, ephedra, guarana and ma huang, found in most energy drinks can cause the heart to race. Dieticians say that while small doses may reduce fatigue, but excess could be troublesome.

Currently, at least two energy drinks, an Australian brand Red Bull and one called V are already available in cans in the market.

Coco-Cola India has also snapped up the business of "Hello", the Chennai-based bottled water brand. Under the agreement, Hello will be withdrawn from Chennai and other pockets of the south in phases. The promoters of the brand, SR Mineral Water, will instead use their manufacturing capacity and distribution network to market Kinley to the bulk pack (25 litres) users.

Retail packs in non-returnable PET bottles will also be manufactured by them. It will help Kinley notch up 70 percent marketshare in the Chennai market at one go. The contract manufacturer of Bailey in Bangalore has defected to the Coke camp. This means Kinley will snap up Bailey's marketshare in one shot.

Coca-Cola's strategy is to increase its presence in the non-cola, non-aerated category. In Hyderabad, the company is setting up a greenfield plant, through its franchisee, for 25 litre returnable jars and retail packs in non-returnable PET bottles of 500 ml, 1,000 ml and 2,000 ml.

Recently, Coke took over Themax Culligan Water Technologies' 20 litre water packs business. This was followed by a strategic alliance with Nuchem Weir. Under these deals, Good Water and Kristal were pulled out from the west and north markets respectively. Sources said the MNC is in a hurry to gain a foothold in the country, especially in the 20-litre segment, which recorded the highest growth in the bottled water segment. Coca Cola which has 58 percent share in overall soft drinks market is also planning to launch ready to drink tea and coffee jointly with Nestle. The two companies will launch their global products like 'Nestea' in India.

UNITED BREWERIES

The United Breweries belonging to Vijay Mallya has 40 percent share in the Rs 3,500 crore beer market with its flag-

ship beer "Kingfisher Lager" alone accounting for 29 percent. Now UB is planning to increase its stake to 50 percent as it is the largest beer maker in the country.

The Bangalore-based liquor major will be launching a premium beer brand 'UB Ice' which is a niche, premium beer with a distinctive sharp taste. Other brands from the UB stable include Kingfisher Strong, Kalyani Black Label, UB Export Lager, London Pilsner and London No 1 Strong.

UB's beer sales have been growing at a rate of about 7 percent annually, while the annual growth of beer market has been around 15 percent.

The company sold about 26 million cases during 2000-2001 and plans to sell over 35 million cases during the current fiscal.

HIGHLAND DISTILLERS

Highland Distillers recently launched the Macallan brand in Mumbai and Delhi at duty free shops. India will be the only country in the whole of Asia where the brand would be available at duty free shops, for \$2100 (Rs one lakh). The company has allocated about 10 bottles in a year for India.

Highland Distillers has plans to launch three to four new brands in India, subject to India's taxation and government policies.

The company, which has its presence in the malt and whiskey segment, will target only the premium one percent population in the country. The brands under HDL's portfolio include Famous Grouse, Highland Park, Bunnahabhain and Tamdhu.

ELEMENTS BEVERAGE COMPANY

Elements Beverage Company, a subsidiary of the Snapple Beverage Company, launched Venom in the US. The new drink boasts a range of energy supplements and contains taurine, yerba mate, bee pollen, Siberian ginseng, guarana, vitamins B₂, B₆, B₁₂, Niacin, Panthothenic Acid and caffeine.

KRAFT FOODS

Kraft Foods, the largest US food company, said that it had stepped up its food safety controls since the terrorist attacks of September 11, which have fuelled increasing concern about potential bioterrorist threats. The company said its safety measures were already "very strong", and added that Kraft would continue to work with regulators to ensure they remained so.

CONAGRA DAIRY FOODS

US food company ConAgra Dairy Foods plans to roll out soon "Electric Blue" and "Shocking Pink" margarines in easy-to-grip 10-ounce bottles designed

to be child-friendly for kids to have a little more fun in eating their vegetables, breakfast and lunch items.

One tablespoon of the margarine provides 10 percent of the USDA recommended daily allowances for calcium and vitamins A, D and E. ConAgra introduced Parkay with calcium and vitamins in tub form recently.

The margarine is expected to be widely available soon.

BIOCOP

Biocorp founded by Scheer in 1996 is the world's leading developer and manufacturer of compostable and biodegradable materials for use in venues and consumer applications. It is one of the first companies to commercialize Nature Works (TM) PLA, a new corn-based plastic.

The new Biocorp clear PLA cups gained a significant boost when Nature-Works PLA was recognized with a Discover Award for Environmental Innovation, presented by the Christopher Columbus Fellowship Foundation.

The new cold drink cup has competitive physical properties with petroleum-based plastics. It has the added environmental benefits of being both naturally based and fully compostable. The post use attributes of the cups also make them a natural fit for Biocorp's existing line of biodegradable products, which includes plates, cutlery, hot drink cups and straws.

The inherent advantage of a compostable cup is that it can simply be thrown away with the food waste and transported to an appropriate commercial or municipal composting facility. There, the food waste and PLA cups biodegrade into water, carbon dioxide and organic material. Compostability also makes such products particularly attractive to food service operators and venues – where the waste stream can be controlled and directed to a composting facility for recovery.

Its products are used in 17 countries around the world by over 1,000 businesses, institutions and cities. Biocorp products are fully compostable and meet stringent international scientific standards. Biocorp is based in Redondo Beach, California.

CONSTAR INC.

Constar Inc., a subsidiary of Crown Cork & Seal Company, Inc. recently launched a resealable pasteurizable PET bottle capable of withstanding the rigorous tunnel pasteurization processes that are used to produce the majority of all packaged beer globally.

The pasteurizable PET bottle has completed successful line trials with Abita Brewery, a New Orleans based brewer. Commercialization of the pasteurization PET bottle will be led by Constar and will be available to consumers early in 2002.

The first single-serve PET beer bottles

re introduced in 1999 and quickly gained favor in "venue" markets including sporting events, concerts and other outdoor activities. As consumer preference grows, there is an expectation that new pasteurizable beer bottle will give the brewing industry the ability to further expand the markets they serve with minimal capital investment.

To develop the new pasteurizable PET bottle, Constar redesigned the container in three key areas. First, the PET container's oxygen and carbon dioxide barrier were improved with Crown's patented Baro(TM) oxygen scavenger. Secondly, the bottle was redesigned using a new, vented base to withstand the rigorous tunnel pasteurization process. Finally, a new barrier closure was developed by Crown's Closure Group for use on the PET package and the bottle thread finish optimized for enhanced sealing. Together, these innovations combine to offer superior performance in the tunnel sterilization environment.

DERS CROKLAAN

Wodders Croklaan, of the Netherlands, has launched a new fat product that is designed to impart flavour and colour to a range of products. Betr-Flakes, the latest addition to the company's range of fats and oils, is a compound flavour system that uses a fat-based encapsulation technique to create clearly defined areas of intense flavour and colour that are preserved during cooking. They offer 'discrete' pockets of flavour and colour normally imparted by fruit, cheese or spices in bakery applications. Incorporated in the dough as a last ingredient before baking, they are easy to store, weigh/handle and do not cause dust or aromas in the work area. Moreover, they are perfectly suitable for use in dry mixes.

WEIKFIELD INTERNATIONAL CORP.

Weikfield International Corp., India, and St. Dalfour of France have together launched Royale Fig, a new sugarless fruit drink. St. Dalfour conserves are made from age-old French recipes from the countryside of Loire. These recipes ensure a delicious yet nutritious food resulting from the conserve produced.

St. Dalfour's Royale Fig conserves are pure fruit without any sugar. The natural sweetness of concentrated grape juice is used as a substitute. The fruits are hand-picked and cooked in special pots to preserve their delicious natural taste. This natural sweetness produces a taste that is fresher than the heavy taste of syrup. St. Dalfour conserves are available in 11 other varieties, namely: apricot, orange, black cherry, cassis, red raspberry, strawberry and four fruits.

BIKANERVALA GROUP

The Rs 100 crore bhujia and chaat-papi major, Bikanervala Group is planning a westward march for their famous savouries and will be opening its first international outlet in Toronto soon, responding to Canadian government's call for entrepreneurs to set up shop there.

SS Aggrawal, Managing Director of the Bikanervala group in Canada stated that his company hopes to serve Indian cuisine to foreign consumers. And hopefully, the Group would be doing just that when the first outlet will open in Toronto. Cosmopolitan Toronto's sizeable NRI component would, of course, be a huge potential market to begin with. So much so, Bikanervala group has plans to open 8 to 10 more outlets in North America in a year's time at a total cost of Rs. 35 to 40 crore.

Bikanervala is no stranger to foreign markets, as it has been exporting namkeen worth Rs 2 crore to the US, UK, Canada,

France, Dubai, Australia and South Africa.

Domestically too, the ISO 9002 company is expanding. It will add an ice-cream parlour, whose products will be outsourced from Supreme Enterprises, a 20-year-old company which supplies to Mother Dairy, Milkfood and major hotel chains. The prices will be very competitive.

NESTLE

The world's biggest food company, Nestle, is to exercise its option to buy well-known luxury ice-cream brand Haagen-Dazs in a deal which will value the brand at about \$1 bn, according to a report.

The move will make Nestle the world's third largest ice-cream business in the US and bring it into head-to-head competition with Unilever, which bought the Ben & Jerry's brand last year. The deal has been made possible after the approval of Diageo's \$11.2-bn sale of its Pillsbury food subsidiary, which owns Haagen-Dazs, to General Mills.

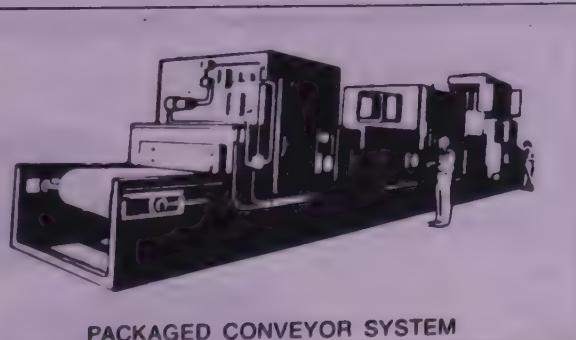
BRITANNIA INDUSTRIES

Britannia Industries in a bid to increase its presence in the southern market has agreed in principle to acquire 49 percent stake in "Snacko Bisc" and its trade mark Nutrine. The Nutrine brand transaction is close to Rs 8-10 crore and will be completed by the end of the year. The Bangalore-based foods major has also reached an agreement in principle with the New Zealand Dairy Board to set up a joint venture in India with its New Zealand Milk Division.

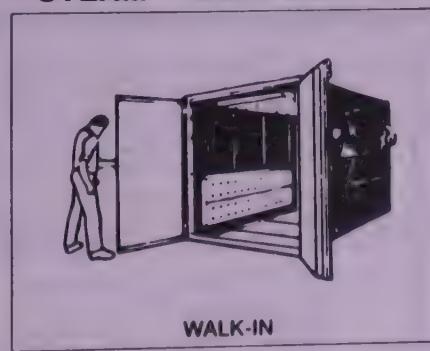
Britannia has identified the New Zealand Dairy Board as a strategic partner because it is expected to provide the necessary research and development support and international experience in the dairy field. The proposed joint venture

SAKAV FOOD MACHINES

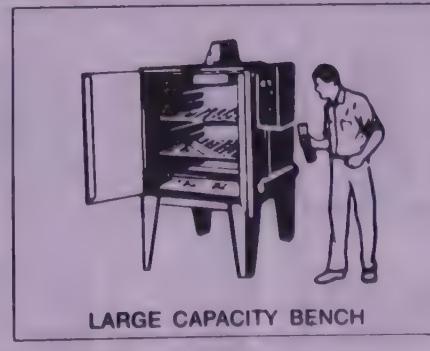
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will manage the current dairy business of Britannia which will include marketing and distribution of milk and milk products in the country. The dairy business of Britannia presently accounts for approximately Rs 165 crore in revenue.

The joint venture will help Britannia leverage the New Zealand Dairy Board's presence in various countries. Sources said that the dairy board has a strategic tie-up with FMCG companies, worldwide. There is also a plan to transfer Britannia's entire milk business to this new joint venture company. Britannia entered the milk business two years ago.

The company had also agreed in principle to acquire 49 percent equity of Kwality Biscuits. This transaction is expected to be completed soon. Analysts say the company's bakery and dairy products have done extremely well in the market.

GOLDEN PICKLE

US company Goldin Pickle has launched a sports drink with a difference, a pickle juice fortified with vitamins and minerals.

The company claims that it has combined the "nostalgic goodness of old fashioned pickles" with modern nutritional supplements to create the unique "sports drink with a bite."

Ingredients include vitamin C, vitamin E and high fructose corn syrup.

FUNCTIONAL FOOD CO.

The US Functional Foods Company announced recently the launch of SmartChocolate bars. The SmartChocolate is sourced from organically grown chocolate and surrounds a truffle centre infused with natural botanicals.

This is definitely chocolate for the health-conscious consumer. The company uses a variety of popular "healthy" herbs such as Gingko Biloba, Green Tea, Guarana, Ginseng and St. John's Wort.

The company claims that it aims to provide the consumer with the finest prod-

ucts made from the purest ingredients in the world. They are working to maintain the integrity and preservation of the rainforests by practicing good stewardship.

HIMJAL BEVERAGES

Coca-Cola India has entered into a strategic tie-up with Himjal Beverages of the Mittals of Kolkata, to bottle and co-pack its Kinley pure drinking water.

Himjal Beverages is setting up a state-of-the-art greenfield plant for the purpose at Pasha Mylaram, 36 km from Hyderabad. The plant will have a capacity to bottle 60 bottles per minute, with provision to scale it up to 120 bottles per minute.

The plant will roll out six lakh cases per day on a single shift basis in three size categories - two litres, one litre and 500 ml.

In addition to the bottles, Kindley drinking water in bulk packs of 25 litre jars will also be packed in the new plant at the rate of 2,000 jars per day with provision to double the capacity to 4,000 jars a day.

Once the Himjal plant goes on stream, Kinley will have a dominant role in the drinking water segment in Andhra Pradesh.

Kindley has been able to capture 40.8 percent of the pure drinking water segment in Andhra Pradesh, reducing Bisleri's market share to just 38 percent.

Andhra Pradesh is "a very important market" for Coca-Cola India as the company's largest chunk of investment - 20 percent of its total Rs 3,600 crore investment in the country - is in the state. Coca-Cola has four large state-of-the-art bottling plants for its soft drinks here and an equal number of major franchisees. Andhra Pradesh also accounts for the highest consumption of Kinley soda.

AMUL

Enthused by brisk sales of its fast food items, popular milk product co-operative, Amul, will set a Rs 20 crore ready-made frozen pizza factory in Gandhinagar.

The new unit would ensure sustained availability of pizzas all over the country

with strict standardisation of various ingredients and the final product to maintain uniform quality.

At present 25,000 pizzas are produced per day, but Amul makes available only cheese, the chief ingredient, apart from training to interested parties in preparation of the product.

The new project, Mr. Vyas said would go a long way in tackling this aspect as the entire range of operations starting from processing and assembly to packaging would be carried out under one roof by highly skilled manpower.

Amul pizzas are currently being sold through some 600 outlets spread over the country of which about 110 are in Delhi alone. The company has production units cum-sales outlets in Mumbai, Ahmedabad, Chandigarh, Panchkula, Varanasi and Allahabad and almost all townships around Delhi.

GOODRICK

Goodricke, one of the largest and finest producers of green tea in India, is making a strong bid to explore home markets for this beverage since some of its export markets in Germany have dwindled over the past year or so.

Not willing to wilt under the gloom, the company's top brass has decided to develop a domestic market for green tea which till now is a small one and largely restricted to northern Indian markets especially Jammu and Kashmir. For almost a year, Goodricke has been marketing a variety of green tea in an attractive pouch in north India. Having tasted some success, it is now making a bid to create a national presence. In the second phase of its green tea marketing plan, the company has launched the product in Kolkata and parts of the eastern region.

Of late, however, China is making vigorous efforts to export green tea to Europe, at prices far cheaper than competitor. According to indications, China is selling green tea between 50 cents to a dollar per kg, which makes it impossible for competitors like India to retain the marketshare.



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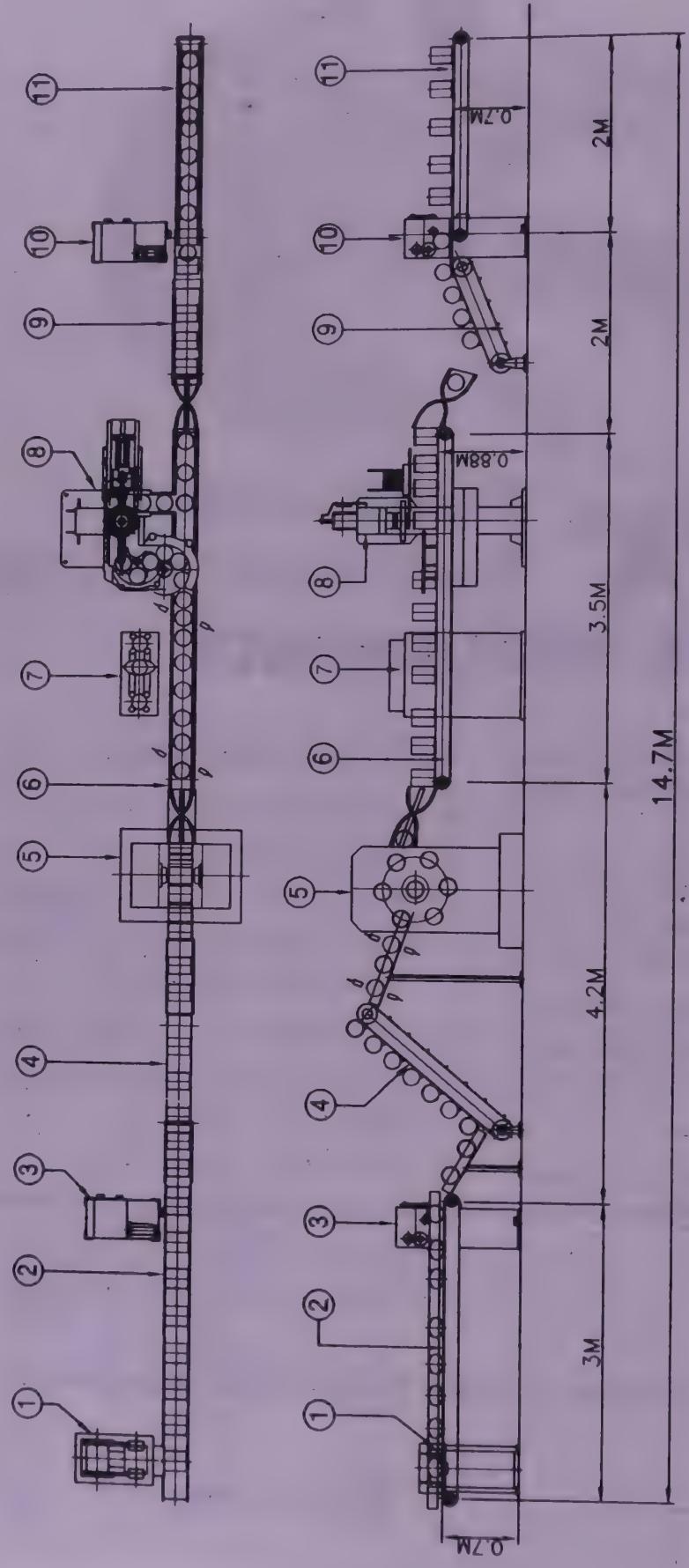
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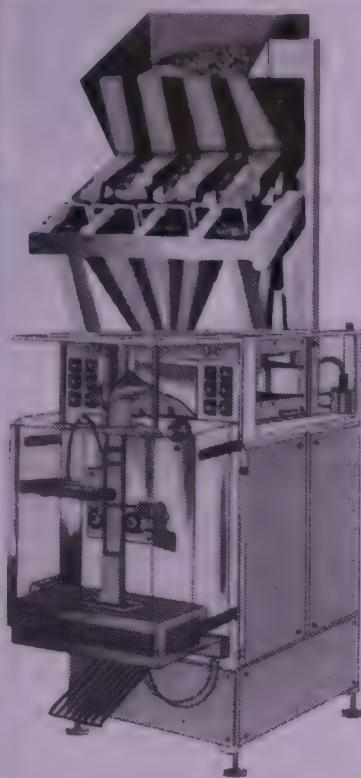
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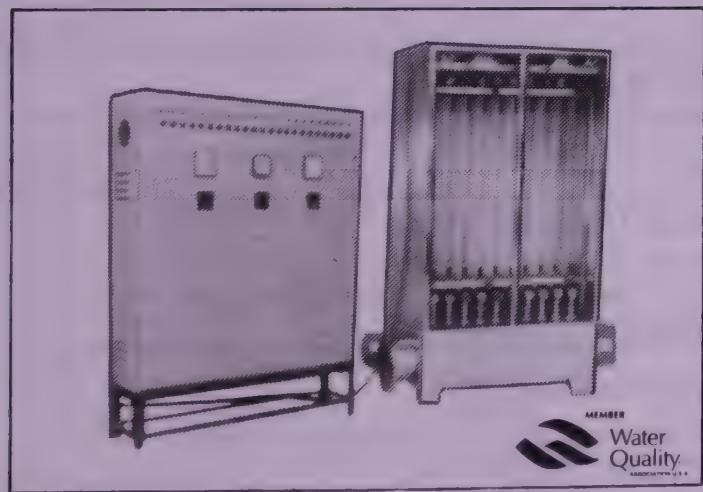
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INDIAN NEWS & NOTES

STATE TO EXIT FROM DAIRY SECTOR

Maharashtra Government has realised that running milk dairies is not the kind of business a state government should get into. Now when it is faced with huge losses of over Rs 225 crores it has finally decided to withdraw.

The state has made significant investments in the dairy business. In the current financial year the government has earmarked around Rs 700 crore for the dairy sector. The government has been buying lakhs of litres of milk every-day to support farmers. The state collects around 40 lakh litres of milk every day out of which 25 lakh litres come from the co-operative dairies. The government-run dairies gather around 13 lakh litres of milk per day. Incidentally, Maharashtra is the only state with a significant involvement in the dairy sector. States like Andhra Pradesh and Gujarat have already brought down their participation in the dairy sector considerably. In Mumbai alone, the dairy requirement of milk runs into 40 lakh litres. But the state-run or co-operative dairies cater only half of it.

Around 20 lakh litres of milk in Mumbai comes from the unorganised sector for which it is difficult to set quality control checks.

NEPALESE VANASPATI ON NEGATIVE IMPORT LIST

The Indian Vanaspati industry has asked the Centre to place Nepalese vanaspati in the negative list of items as per annexure 'C' of the Nepal Trade Treaty or put a clause saying that the goods that are manufactured in Nepal should contain not less than 55 percent of Nepalese materials or Nepalese and Indian materials under the renewed Indo-Nepal Trade Treaty.

Industry sources said that Indian companies had also started sourcing their vanaspati from Nepal as it was cheaper to produce in Nepal and import into India.

After the amendment of the Indo-Nepal treaty in 1996 which withdrew the provision relating to "rules of origin" and allowed duty free imports into the country,

import of vanaspati, had surged.

The centre has been contemplating imposing a 30 percent value-addition clause on imported vegetable oil from Nepal, but industry sources say that the 30 percent value addition clause would not help the domestic industry, since Nepalese product would continue to be priced lower than the Indian vanaspati.

EXPORTS OF NON-BASMATI RICE ON THE RISE

Exports of non-basmati rice have gained momentum with traders booking orders of nearly six lakh tonne.

Exporters say that if the international

importers to look for other options, India being a major one among them.

South Africa, Nigeria and Saudi Arabia are main buyers of Indian rice. Moreover, the market has become brighter with Vietnam cutting its rice export target by 500,000 tonne to 3.5 million tonne for the current year. The move has triggered a rise in the price of Vietnamese rice as Vietnamese traders are trying hard to get supplies at the right price to fulfill their export commitments, the farmers are sitting on stocks in expectation of higher prices.

Moreover, to facilitate exports of non-basmati rice, the government has lowered the minimum purchase quantity of the commodity to 2,000 tonne from the earlier requirement of 10,000 tonne.

According to analysts, India is likely to export about a million to one and a half million tonne in the coming 4-5 months, if the price is at par with international levels.

EGYPT TO IMPORT MEAT FROM INDIA

In connection with the import of meat from India, Egyptian Government has decided to send 6 veterinary inspectors to remain stationary at various abattoirs to supervise the meat processing in India before it is shipped to Egypt.

SAFFRON

Saffron, the most expensive spice in the world, is obtained from the stigma of the flower of *Crocus sativus*, commonly known as Rose of Saffron.

Farmers handpick the Rose of Saffron and afterwards separate the red stigmas from the rest of the flower. The fact that more than 85,000 flowers are needed to obtain just one kilo of saffron, gives us an idea of how hard this work is and why this product is so expensive.

Saffron has three properties that make it very valuable in cooking. These are:

- Colouring power: Saffron gives a yellowish colour to meals, which enhances them, making them look more appetizing
- Flavour: The flavour of saffron is unique when used in the correct quantity, it gives

market continues to remain favourable, the country is likely to meet the export target of three million tonne during the current year (April 2001-March 2002).

Indian parboiled rice is selling at a range of \$165-170 per tonne freight on-board (f.o.b.) in the international markets while the ruling price is much higher at \$225-230 per tonne f.o.b. which has led

the dish a slightly bitter and earthy taste that makes it delicious. • Aroma: The aroma of saffron is very appealing and is also used for perfumes.

Saffron has many medicinal properties as well. Boiled with milk, tea or coffee, it is good for the throat, for blood circulation and it also gives strength for sexual life.

Since saffron is a very expensive spice, many people will try to obtain extra profits by adulterating it. Therefore, it should be bought from a trusted brand name.

Moreover, a saffron that is completely red with many small broken filaments should not be trusted. It is probably adulterated.

Long trumpet shaped filaments that have a yellow termination should be sought after since this is the natural presentation of saffron.

Finally, do not trust some cheap brands of saffron packed in red cellophane. This fancy packaging does not allow checking the quality of the product and when opened, one might find that it is adulterated.

\$3.5 M ORGANIC TEA PROJECT FOR INDIA & CHINA

The Common Fund for Commodities (CFC) under the Food and Agriculture Organisation (FAO) has approved a joint proposal for the development of organic tea in India and China at a total cost of \$3.5 million. The proposal to set up a pilot project was submitted to the Inter Government Group (IGG) on Tea in Canada two years ago by India and China. The proposal was later given to CFC for consideration.

L V Sapharishi, additional secretary, ministry of commerce, said the IGG has also decided to set up a working group of scientists from producing and consuming countries to examine the issues of minimum residual levels (MRLs) of pesticides. "The group will examine the scientific data

available in India and other tea producing and consuming countries and will suggest acceptable levels of MRLs, which will assist the existing international bodies like Codex Alimentaries to arrive at harmonised and universally acceptable standards," Sapharishi added.

India has also proposed a scheme for generic promotion of tea based on its health benefits for funding by CFC, he added. FAO's commodities division chief David Hallan said a "tea mark" has been developed worldwide and adopted by 32 countries after being test marketed in four countries.

KARNATAKA TO SET UP FIVE FOOD PROCESSING PARKS

Karnataka is all set to create waves in the food processing sector with five food processing parks coming up in the state with a total investment of around Rs 1,250 crore. The units are to be set up over a period of three years. The move is aimed at increasing the exports of processed food from Rs 1,500 crore every year to Rs 5,000 crore in the next five years. The parks will come up at Bagalkot, Belgaum, Chitradurga, Kolar and Madur. The implementation is in its final stages and land acquisition has been completed, and the work is likely to start soon.

KUWAIT LIFTS BAN ON INDIAN MEAT

Countries in the middle eastern region had banned Indian meat after a suspected outbreak of foot and mouth disease. Egypt and Jordan had lifted the ban earlier and now Kuwait has followed suit. This is a major victory for the Indian meat industry since the ban had hampered exports from the country in the first quarter.

This will give a psychological boost to exports as the Middle East countries have a tendency of working in tandem when it comes to health related aspects of imported foodstuffs.

Animal products exports has risen to Rs 1637.16 crore in 2000-01 from Rs 905 crore with increase in demand from the Middle East which sourced a large part of its buffalo meat requirements from India as the mad cow and the foot and mouth disease afflicted livestock in Europe.

Indian buffalo meat is deboned, deglanded and frozen. FMD virus cannot survive in the frozen state in which meat is exported. Deboned, deglanded, frozen buffalo meat forms more than 70 percent of India's total meat exports which also includes sheep and goat meat.

New Zealand, the EU, US, Canada, Argentina and Brazil are major importers of meat. India's share in the international meat trade is a meagre two percent. After the UN Food and Agriculture Organisation issued health warnings about meat imports, meat consuming countries have become cautious.

DISCREPANCIES IN IMPORTED DAIRY ITEMS

The National Dairy Development Board (NDDB) has reported discrepancies in consumer packs of some imported milk products like cheese, butter, cream and milk. The discrepancies pertain to the labeling provisions and declaration of maximum retail price under the Prevention of Food Adulteration Act (PFA) and Standards of Weights and Measures (Packaged commodities) Rules, 1977. The government has taken some corrective actions. The Ministry of Health, which is responsible for administrating the PFA Act and Rules, has instructed all the state governments to ensure that all food articles, whether imported or indigenously produced and marketed, are subjected to regular checking so that their quality conforms to the provisions of the PFA Act, 1954 and the PFA Rules, 1955. The Ministry of Commerce and Industry, earlier, ordered that all such packaged products shall be subject to compliance with the import provisions.

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HIKE IN EXCISE DUTY ON COUNTRY LIQUOR

The state cabinet has on 10th October 2001, approved a hike in the excise duty charged on country liquor (raising it from Rs 45 per litre to Rs 47.5 per litre) and Indian Manufactured Foreign Liquor (IMFL) from Rs 125 to Rs 150 per litre.

Similarly, the license fees charged from distilleries, beer bars, wine shops, country liquor shops and clubs will witness a two-fold to four-fold increase, which is expected to raise Rs 155 crore additionally.

The increase in state revenue collections from liquor is expected to net an additional Rs 25 crore from country liquor and Rs 15 crore from the IMFL segment.

CALIFORNIAN GRAPES IN INDIAN MARKET

After Australian apples and New Zealand Kiwi fruit, now the Californian table grapes are soon expected to make a mark in select Indian markets.

"The first containers carrying 15,000 kg of grapes have already arrived and we have started promotions at various locations in the city," said Sumit Saran, India representative for California Table Grapes Commission.

California produces 97 percent of commercially grown table grapes in the United States and ranks third in the worldwide production of these grapes, following Italy and Chile. California produces around 900,000 tonnes annually and exports around 300,000 tonnes.

CHEESE POWDER GAINING GROUND IN FOOD INDUSTRY

The first industry to use cheese powder was the Biscuit Industry. Now cheese powder is also used in snack products, salad dressings, ready meals, baby food, sauces, etc. Cheeses of different quality and ripeness go into production, from the finest consumption products to cheeses which have been scrapped due to de-

fects. Trained product manufacturers mix the different cheeses into the right composition, an art quite in line with whisky or wine blending.

The present cheese powder market is characterised by three main trends. First of all, the general awareness of the bacteriological food standard influences the demands of the customers to the company as a supplier. By ensuring that no product leaves the plant until bacteriologically approved. Second trend is a rising resistance against using artificial additives. And thirdly, there is a growing demand for cheese-based products, which have not been manufactured using animal rennet.

SHELF LIFE NORMS FOR IMPORTED FOOD PRODUCTS

The Directorate General of Foreign Trade (DGFT) has issued a notification saying that imports of all edible and food products, domestic sales and manufacture of which are governed by the Prevention of Food Adulteration Act 1954, shall also be subject to the condition that, at the time of importation, the products are having a valid shelf life of not less than 60 percent of the original shelf life. This stipulation would prevent sale of imported edible products to consumers after the expiry date.

The shelf life of the product is to be calculated on the basis of the declaration given on the label of the product regarding its date of manufacture and the due date of expiry.

In a related move, imported products of animal origin – like frozen meat – has been subjected to sanitary conditions. Those importing such shipments have to obtain sanitary import permit to be issued by the Department of Animal Husbandry and Dairying.

The notification also stipulates that sanitary import permit is necessary for import of animal products. In accordance with the conditions of Livestock Importation Act 1998, as amended by Livestock

Importation (Amendment) Ordinance 2001, import of these products would be subject to meeting sanitary conditions. Import of meat and meat products will be covered under this stipulation along with poultry products, tissue or organs of pig, sheep, goat, egg and egg powder, milk and milk powder, bovine and pet food products of animal origin. Import of these products will not be allowed without a sanitary import permit.

KNEADER-EXTRUDER FOR CHHANA

Dr. Durga Prasad Tavva, Dr. S.K. Makker, Dr. Ruplal Choudhary and Dr. S.N. Jha of NDRI, Karnal have developed a kneader-extruder to integrate the process of kneading and forming of Chhana into cylindrical shape. The equipment has two zones, viz. a feeding and conveying zone and kneading and forming zone. A kneading element was incorporated in the second zone for efficient kneading of Chhana. The operating parameters, viz. the screw speed and the clearance between the die and kneading element were optimised with the help of penetrometer studies (under constant compressible stress conditions) and retardation time (under constant shear stress conditions). These parameters were selected on the basis of the hypothesis that constant shear and compressible stresses are to be applied in giving the final shape to Chhana so as to make it suitable for rasogolla-making.

HACCP CERTIFICATION PROGRAMME FOR SMES LAUNCHED

The Federation of Indian Chambers of Commerce and Industry (FICCI) has launched a national Hazard Analysis Critical Control Point (HACCP) certification programme covering small and medium enterprises (SME) in the domestic food processing industry.

HACCP is a concept which helps identify food safety hazards. It is an interna-

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tionally recognised system for managing risks associated with the food industry.

The programme would help in improving the quality of the end products making product's acceptability easier in the competitive international markets, besides the domestic market. Demand for quality food products is on the rise and could be gauged by the increasing consumption of bottled water.

To make HACCP certification more affordable, the European Union had promised to subsidise 50 percent of the total cost, which is estimated to be around Rs 1 crore. The subsidy was necessitated as cost was one of the major factors which influenced the SMEs' decision to go in for HACCP certification. All the selected units are expected to receive their certification by the middle of next year.

FICCI is also engaged in conducting "trainers training programme" to address the issue of shortage of resource personnel besides developing training materials for the selected SMEs.

PROPOSED EXPORT ZONE FOR FRUITS AND VEGETABLES IN DIFFERENT STATES

Different states will be setting up export zones for fruits and vegetable. The West Bengal government will set up an pineapple export zone in Jalpaiguri. The project will be set up at the cost of Rs 38 crore spread over an area of 10,000 hectares. Initially a processing unit with juice extraction capacity of 5 tonne per hour will be set up. The Karnataka Government would set up different export zones for gherkins pomegranates, onions, grapes and mangoes. In Uttar Pradesh an export zone for floriculture and mangoes. Litchi export zone in Bihar and for vegetables in Punjab. In Maharashtra there will be two export zones for grapes and floriculture. Himachal Pradesh will have for apples & apple related wines, mango export zone in Vijaywada.

VALUE-ADDED SPICES/OLEORESINS EXPORT SHOWS STEADY GROWTH

The growth trend in the exports of value-added spices such as mint oil, oils and oleoresins of spices and curry powder indicated that these items would take over the top slot in the exports of spices.

Export of curry powder had gone up from 1,333 tonnes valued at Rs 1.07 crore in 1974-75 to 5,210 valued at Rs 35.97 crore in 1998-99. Similarly, mint oil ex-

ports went up from 1,510 tonnes valued at Rs 26.06 crore in 1992-93 to 4,207 tonnes worth Rs 122.52 crore in 1998-99, while oils and oleoresins of spices rose to 2,750 tonnes valued at Rs 300.77 crore in 1998-99 from a meagre 42 tonnes valued at Rs 0.48 crore in 1974-75. Last fiscal exports of oleoresins and spices oils alone stood at Rs 345 crore. Given this positive trend, the current fiscal's target for curry powder had been set at 6,500 tonnes valued at Rs 42.00 crore, while that of mint oil was 4,000 tonnes worth Rs 152 crore and spice oleoresins and oils at 3,800 tonnes valued at Rs 418 crore.

The total target set for value-added spices was Rs 612 crore for the current fiscal while that of pepper was 35,000 tonnes valued at Rs. 315 crore. Though exports of oleoresin, essential oils and spices oils have shown significant growth in recent years, the industry has been able to utilise only 35-40 percent of its total installed capacity for want of enough demand.

The annual global consumption growth rate is around 5 percent per annum. Given the slow growth in global demand and poor rate of capacity utilisation, there is little chance to raise the installed capacity in the immediate future.

Of the total oleoresin exports, 50 percent is chilli and it is the single largest oleoresin used for natural colour in the world. The global consumption of this item is 3,000 tonnes and of this 1,750 tonnes are exported from India.

Following the short-supply of this high colour chilli, there was potential to export around 1,000 tonnes more, raising, exports revenue by Rs 130 crore.

The second major export item is pepper oleoresin. Piperine is mainly used in the food industry, mostly as a substitute for pepper. The major items included oleoresins of ginger, celery seeds, turmeric, cardamom, mustard, seed spices such as coriander, fenugreek, clove, cumin casia and nutmeg.

CARBONATED BLACK TEA

'Celebrate Camellia' is a swadeshi cola with a difference. It is carbonated black tea, that has hit the Coimbatore market after its launch at the recent Agri Intex Fair 2001.

Available in two flavours - lemon and mango - the drink takes the colour of Coke/ Pepsi, but for the flavour and taste.

Ms Sashikala has developed an instant tea formula called 'Celebrate Camellia'. It is carbonated black tea which prevents headache and helps in proper functioning of blood vessels. The antioxidant present in the tea fight the virus causing influenza and the polyphenols prevent cancer. It is available in two flavours, lemon and mango and has a shelf life of six months at room temperature.

FISH PRESERVATION

The Food Technology Division of Bhabha Atomic Research Centre (BARC), India, has developed three methods to preserve fish products. These processes involve controlled application of the energy of ionizing radiations like gamma rays, X-rays and accelerated electrons. The new techniques - radurization, radicidation and disinfestation - would help extend the shelf-life of fish products.

ITDC TO LOWER LIQUOR, WINE PRICES AT DUTY-FREE SHOPS

The prices of some liquors and wines are set to be slashed and promotional schemes introduced at duty-free outlets run by ITDC to make customer-buys very attractive.

Customs rules prevents any incoming passenger from buying more than one bottle of liquor and one of wine, and outgoing travelers from picking up more than three bottles. While the customs officials were said to be a little lenient earlier, in recent months they have been strictly following the rule book, dampening any promotion planned by ITDC.

Sources said apart from wanting to boost sales, which have slackened due to a drop in traffic and availability of more attractive deals at other foreign airports, ITDC also wants to reduce its large inventory piled up over a period of time. Some months back, the inventory of some slow-moving brands was close to Rs 26 crore. While these brands have already been paid for by the corporation, it is still seeking concessions from the manufacturers so that it can cut pieces.

ITDC has also approached CBDT for relaxation of its restriction on at least the outgoing passenger since it directly impacts any effort to boost sales. Worldwide, while many countries do impose limitations on the quantity of imported liquors/cigarettes coming into the country, there is no restriction on outgoing passengers.

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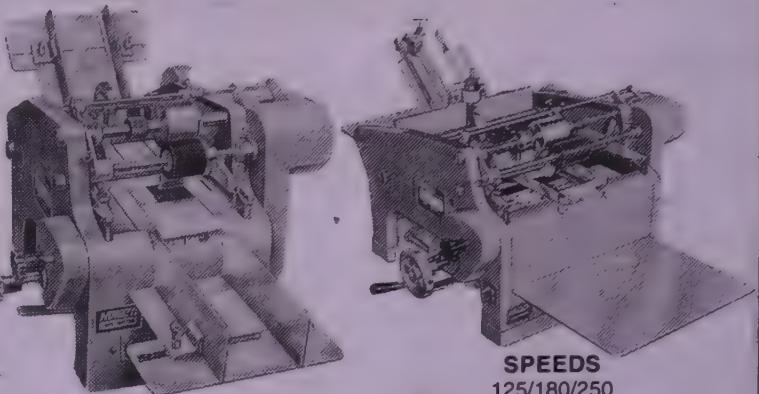
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INTERNATIONAL NEWS

ORGANIC OIL TO PROTECT AGAINST DANGEROUS BACTERIA

An American researcher has found that oil from the common herb oregano may be an effective treatment against dangerous, and sometimes drug-resistant bacteria.

Two studies have shown that oregano oil – and, in particular, carvacrol, one of oregano's chemical components – appear to reduce infection as effectively as traditional antibiotics. These findings were presented at the American College of Nutrition's annual meeting in Orlando, Florida.

Harry G. Preuss, professor of physiology and biophysics, and his research team, tested oregano oil on staphylococcus bacteria, which is responsible for a variety of severe infections and is becoming increasingly resistant to many antibiotics.

They combined oregano oil with the bacteria in a test tube, and compared oregano oil's effects to those of standard antibiotics streptomycin, penicillin and vancomycin. The oregano oil at relatively low doses was found to inhibit the growth of staphylococcus bacteria in the test tubes as effectively as the standard antibiotics did.

Another aspect of the study examined the efficacy of oregano oil and carvacrol, which is believed to be the major antibacterial component of oregano, in 18 mice infected with the staph bacteria.

Six of the mice received oregano oil for 10 days, and 50 percent of this group survived the 30 day treatment. Six received the carvacrol in olive oil, not oregano oil, and none survived longer than 21 days. Six mice received olive oil alone with no active agents (the control group) and all died within three days. A repeat study corroborated these findings, which demonstrates that there are components of oregano oil other than carvacrol that have antibiotic properties.

The ability of oils from various spices to kill infectious organisms has been recognised since antiquity. Natural oils may turn out to be valuable adjuvants or even replacements for many anti-germicidals under a variety of conditions.

TO COMBAT CANCER

New research at the University of California, Berkeley, may add yet another boost to the healthy reputation of the soybean.

More than two years ago, the same UC Berkeley researchers discovered that injecting the lunasin gene into cancer cells in a culture stopped cell division. In their latest work, they tested whether the lunasin protein could prevent normal cells from becoming cancerous in both cell cultures and in mice.

In the study, varying doses of lunasin were applied to groups of mice over a period of 19 weeks. They were compared with a control group that had received no lunasin treatments. After the mice were exposed to chemical carcinogens, the group that had received the highest lunasin dose of 125 micrograms twice a week had a 70 per cent lower incidence of tumours than the control group.

De Lumen is a member of UC Berkeley's Health Sciences Initiative, a partnership among biomedical sciences and technology programs geared towards advancing research into today's major health problems.

The researchers got clues on how lunasin works through tests in cell cultures. They showed that lunasin binds to deacetylated histones, a specific form of protein in a cell that helps package the long strands of DNA into tight coils. Lunasin seems to target cells before these histones undergo acetylation, a crucial step recently linked to cell proliferation and the formation of cancer.

In one of the tests, the cells from a lunasin culture showed an 80 percent lower incidence of transformation into cancer cells compared with non-lunasin cultures after exposure to carcinogens.

"The chemical changes that occur in normal cells before and during cancer formation signal lunasin," said de Lumen. "We believe lunasin is like a watchdog; it's out there sniffing. When it sees a normal cell transforming, it gets in there and attacks the cell."

Studies on the health effects of soy products have been increasing over the years. In 1999, the U.S. Food and Drug Administration allowed manufacturers to use food labels stating that eating 25 grams of soy protein a day may help reduce the risk of heart disease. Foods must contain at least 6.5 grams of soy protein per serving to qualify for the label.

LACTIC ACID HAS LITTLE EFFECT ON E. COLI

Buffered lactic acid has little effect on the proliferation of E. Coli in beef tissue,

Belgian scientists reported.

Scientists from the Department of Food Technology and Nutrition, at University of Gent in Belgium studied a varied level of acid resistance among the 14 tested strains of *Escherichia coli* 0157:H7.

Eight strains were categorised as acid resistant, four strains as acid sensitive, and two strains demonstrated acid-inducible acid resistance. The survival of an acid-resistant (II/45/4) and acid-sensitive (IX/8/16) *E. coli* 0157:H7 strain on chilled beef tissue treated with 1 and 2 percent buffered lactic acid, sterile water, or no treatment (control) was followed.

A gradual reduction of *E. coli* 0157:H7 was noticed during the 10 days of storage at 4°C for each of the treatments. Decontamination with 1 percent and 2 percent buffered lactic acid did not appreciably affect the pathogen, and differences in the pH-independent acid resistance of the strains had no effect on the efficacy of decontamination.

The effect of modified atmosphere packaging (MAP) on survival of *E. coli* 0157:H7 in red meat was also studied. MAP (40% CO₂/60% N₂) or vacuum did not significantly influence survival of *E. coli* 0157:H7 on inoculated sliced beef (retail cuts) meat compared to packing in air.

The relative small outgrowth of lactic acid bacteria during storage under vacuum for 28 days did not affect survival of *E. coli* 0157:H7.

The scientists conclude that neither lactic acid decontamination nor vacuum or MAP packaging could enhance reduction of *E. coli* 0157:H7 on beef, which underlines the need for preventive measures to control the public health risk of *E. coli* 0157:H7.

ANTIBIOTICS IN ANIMALS BREED RESISTANT SALMONELLA — NEW EVIDENCE

One in five samples of ground meat and poultry taken from US supermarkets was contaminated with salmonella, and most samples were resistant to antibiotics, a US study reports.

Scientists from the Department of Nutrition and Food Science, at the University of Maryland set out to identify and characterise strains of salmonella isolated from ground meats purchased in the Washington, D.C., area.

Salmonella was isolated from sam-

bles of ground chicken, beef, turkey and pork purchased at three supermarkets. The polymerase chain reaction and DNA sequencing were used to identify resistance integrons and extended spectrum-lactamase genes.

Results showed that of 200 meat samples, 41 (20 percent) contained salmonella, with a total of 13 serotypes. Eighty-four percent of the isolates were resistant to at least one antibiotic, and 53 percent were resistant to at least three antibiotics.

Sixteen percent of the isolates were resistant to ceftriaxone, the drug of choice for treating salmonellosis in children.

The scientists conclude that resistant strains of salmonella are common in retail ground meats. They stress that their findings provide support for the adoption of guidelines for the prudent use of antibiotics in food animals and for a reduction in the number of pathogens present on farms and in slaughterhouses.

LIQUID BUTTER SUBSTITUTE

A process to prepare low-calorie liquid butter substitute has been developed in the United States by Mr. A.D. Roden, Mr. L.M. Snyder and Mr. T.A. Pelloso. The liquid butter replacement exhibits a pleasant fat-like mouthfeel, despite a very low or no fat content, good colour and flavour, and a degree

of fat-like melt without causing toast or other similar substrates to which the product is applied to become soggy.

A flowable fat mimetic is prepared from an aqueous solution comprising a cross-linkable carbohydrate gelling composition (preferably pectin) and at least one gelling agent (preferably a calcium salt). These together form a heat-stable inner gelled phase, which is agitated to produce gel particles that provide an organoleptic sensation to fat. The weight of the fat mimetic is at least about 75 percent of the weight of the butter substitute. The flowable fat mimetic is then combined with a second, continuous outer phase containing an unhydrated heat-reversible or heat-thinning, water-soluble gelling agent, and preferably salt and milk or milk solids. The product thus formed exhibits good melting properties, little syneresis and maximum flavour impact, similar to a full fat margarine.

VEGETABLE PROTEIN ISOLATE

Burcon, Canada, has developed a plant-based protein that can compete with meat, egg and milk proteins in nutritional effectiveness and functionality. The protein isolate is extracted from canola meal by a patented technique. The seed pods of canola are crushed to obtain canola oil and the remaining protein-rich canola meal is sold as livestock feed.

Puratein is an odourless free-flowing powder of less than 300 microparticle size. It has a bland flavour, off-white colour and does not require refrigerated storage. Puratein exhibits some foaming and whipping properties, gel-forming ability, water and fat binding properties and emulsification qualities. It can be used in cakes and pastries, processed meats, mayonnaise and salad dressings and as meat-firming agent.

NEW PRESERVATION SYSTEM

Purepulse Technologies Inc., the United States, has developed method and apparatus for food product preservation by deactivation of micro-organisms and enzymes. This is achieved by employing high-intensity, short-duration pulses of polychromatic light in a broad spectrum to packaging material surfaces. A photodiode is used to detect the intensity of the light and a control circuit to adjust power delivered to a flashlamp if the intensity of the light needs adjustment. The outer safety glass, used to protect the flash-lamps, may have a surface coating. The lamp holding device allows a proximal portion to move relatively to a distal portion thereof. A light guide is positioned to receive light emitted from linear flashlamps and to transmit such light into the packaging material cup.

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PRODUCT REVIEWS

EDIBLE OILS

Kamani Oil Industries leading manufacturers of high quality edible oils and fats cater to the consumer and institutional market as well as bulk segment. The company is equipped with fully integrated plant with modern equipments.

Kamani Oil Industries offers a wide spectrum of oils and fats to suit every customer.

Their R&D with its advanced testing facilities is at the service of the customers for any kinds of trouble shooting issues and can provide cost effective solutions besides new product developments.

Their products find diverse application in areas such as bakery, ice cream, confectionery, catering, snack food, pharmaceuticals as well as health foods.

Their product range includings : • Vegetables oils for cooking • Industrial frying and special culinary applications • Fats for frying, bakery and confectionary products • Tailor made specialities.

For more details, contact:

Kamani Oil Industries
Pooran Asha Bldg.
317, Narsi Natha Street
Mumbai 400009
Tel: 3435967, 3420241/2
Fax: 91-22-3435964
Email: kamani@bom2.vsnl.net.in

CODE/CARTON PRINTING MACHINES

Nimach Engineering Company is a manufacturer and exporter of "Nimach" brand fully automatic high speed code printing machines and carton printer machine. The automatic label code printing machine prints labels from 50x25mm size to 200x15mm size. Stereo and metal letter press types can be used. Carton printing machine can print carton from size 90x50mm minimum to 325x125mm maximum at the speed of 125/180/250 Label-carton/minute. The carton can be plain locked bottom carton and catch cover can be printing. These machines find use in Food and Beverages industries, dairy, pharmaceuticals and cosmetic. The 'Nimach' brand machines are marketed by Monita Industries Corporation.

For more details, contact:

Nimach Engineering Co.
6, Rajani Estate
Opp. Gujarat Bottling
Rakhial, Ahmedabad 380 026
Telefax: 079-2743083

SOLID STATE INDUCTION CAP SEALING MACHINE



Packagers of Oil, Pharmaceutical, Pesticides and Food products all turn to induction cap sealing to solve their capsealing needs. Maintaining a tamper resistant, air tight and leak resistant seal on packaged goods is foremost for packagers concerned with preserving the integrity of their products. Electronics Devices induction capsealing system, empowers packagers to seal from 10 to 120mm closure sizes closure sizes at desired line speeds.

Induction Cap Sealing Machine were developed to cater to the requirement of the Packaging industry. There are several distinct advantages to induction sealing. • Tamper evidence — deter pilferage • Leak Prevention — No rejection, hence enhanced profits • Increased Shelf life — product freshness • Assurance to the end user — win your customers con-

FILLING MACHINES

Apex Electromec Pharma Pvt. Ltd., having industrial machine manufacturing experience of nearly two decades, has made its formidable foray in food and beverage Industry.

The company manufactures single and multiheaded automatic powder/granule fillers. The accessories it offers for the filling line are swing and slat conveyor, turntable, endless packing conveyor and combicapping multiheaded machine.

Apex Electromec Pharma also offers

fidence • A sealed product is perceived to be safe and hygienic.

Electronics Devices is the original manufacturer of solid state induction capsealing systems. As the leading supplier of induction capsealing systems worldwide, our continued commitment to quality and state-of-the-art technology drives our research and development further into the further.

Electronics Devices have supplied this machine to many leading industries all over the country and have even exported them to Egypt, Nepal and Abu Dhabi. The customers include leading Oil Companies, Food, Pharmaceutical and Pesticides Industries.

Their machines are very rugged and reputed to give trouble free service. All the components are highly over rated to give continuous duty operation. These machines are designed for 24 hours a day, 7 days a week continuously operation.

The company offers a complete lab and test facility to test the materials for the most economical system, determine line speed capabilities and ensure the proper fit between the conveyor and the capsealing system.

For further details, contact:

Electronics Devices
31, Mistry Industrial Complex
M.I.D.C., Cross Road 'A'
Andheri (E)
Mumbai 400 093
Tel: 91-22-8221649/8394629
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Near Vaishali Nagar
Dahisar (E), Mumbai 400 068
Tel: 8964096, Telefax: 8960263
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Satish Enterprises also imports and resells the Inkjet Inks / Makeup for Coding by CIJ Printer like Videojet®, Domino®, Willet®, Linx®, Imaje® etc.

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Satish Enterprises

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New Delhi 58
Tel: 91-011-5516904, 5535353, 5502859
Fax: 91-011-555363
Email: codeprnt@bol.net.in
info@satisfenterprises.com
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CANNING MACHINES

Cantech Machines established in 1987 by A. P. Pandya, an engineer with over 30 years of experience at Metal Box Co. of India Ltd. is a trusted name for fruit and vegetable canning machineries.

Cantech's can seaming and reforming machines have international standards and are highly suitable for canning fruits and vegetables. The machines have the capacity to manufacture 10-30 cans per minute.

The Can Seaming & Reforming Machine is Semi Automatic Seaming Can with diameter 51 mm to 178 mm and height 51 mm to 248 mm. Output 20-40 cans per minute depending on size. The

FILTERS

Kumar Process Consultants & Chemicals Pvt. Ltd. are manufacturers of quality filters for the last 20 years. They offer a wide range of filters such as bag filters, stalked ring filter, cartridge filter, activated carbon filters and many more.

The filters supplied by them are used in the entire spectrum of beverage industry for soft drinks, packaged fruit juices, whiskies, beers and brandies. The filters impact ultra fine clarity and right consistency. Their filters are used by all the mineral water manufacturers and mineral water plant suppliers all over India and Nepal to ensure consistent quality



BAKING MACHINE

R&D Engineers are India's first & foremost manufacturers of Wafer biscuit & Ice-cream cone machines. Their years of experience and with the application of latest design and technologies to meet exacting market demand. Their product ranges from small table top machines to fully automatic machines. They also design and supply tailor made solutions to an individual customer need.

R&D Machines are characterized by highest standards in precision, in operating ease, utmost durability and service life.

The "ZE" series of semiautomatic

machines are robust, and easy to handle.

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machines are used for baking ice cream cones, sugarcane and cups. These machines are easy to use and are robust. The heating is by electrical heaters designed to optimize energy use and thermal distribution, still flexible for high production on nonstop basis for 24 hours.

The machines manufactured by them are Ice cream Cone baking machine, Batter mixing machine. Automatic Wafer baking machine,

Manual Baking Tongs, Rolled Sugar cone machines, Automatic and Semi-Automatic baking machines.

For more details, contact:

R&D Engineers

A-41, IDA Kukatpally
Phase II, Road No. 4
Via I.E. Gandhi Nagar
Hyderabad 500 037
Tel: 3079121, 3079878
Fax: 91-40-3078668
Email: randengg@hd1.vsnl.net.in
Website: www.rndwafers.com

equipment are some of the other machines manufactured.

Cantech seaming machines have also been exported to the Middle East and various African countries. Cantech represents Shin-I Machinery Works Co. Ltd., Taiwan for high speed seamers and Chase Manhattan Inc-Taiwan for easy open ends.

For further details, contact:

Cantech Machines
13, Vora Bhawan
1st Floor, King Circle
Matunga (C.R.)
Mumbai 400 019
Tel: 4096086, 4096853
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For more details, contact:

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35, Grace Plaza
S.V. Road, Jogeshwari (W)
Mumbai 400 102
Tel: 6790610, 6794611, 6794327
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Bairocade is an invisible epoxy-amine coating applied electrostatically to the outside of the PET bottle. The coated bottles are then passed through an infrared oven for curing. The coating improves the bottle's barrier properties and also imparts a glossy, scuff resistant finish.

A unique feature of Bairocade is the fact that it is a conventional spray coating applied by a conventional electrostatic technique. In addition the coating can be tailored to different product requirements by suitably formulating the epoxy-amine solution used.

1) Bairocade 32020 is formulated for use with highly sensitive products and is claimed to reduce OTR (oxygen transmission rates) by 20 times when compared with monolayer PET. 2) Bairocade 32050 for acidic products such as juices reduces OTR by three times. 3) Bairocade 44030 for CSD

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Garuda Engineers are manufacturers of excellent quality groove and flat rubber stereos for all kinds of packaging products mostly used by Pharmaceuticals Foods, Pesticides, Agro, Distillers, Beverages and Packaging industries. Other machines available with them are

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Tel: (O) 371 9455
Fax: 91-22-4465521
Telefax: 4465521
Email: filsep@vsnl.com
Website: <http://www.aquafilep.com>

reduces CO₂ transmission rate by 20 times.

For product identification or marketing purposes it is also possible to colour the Bairocade solution to impart a desired tint to the coated bottles.

Since the coating is on the outside of the bottle there is no problem with regard to food contact regulations and the material is FDA approved for food packaging use. As regards recycling, the Bairocade can be removed by washing with cleaning solutions in the standard recycling process.

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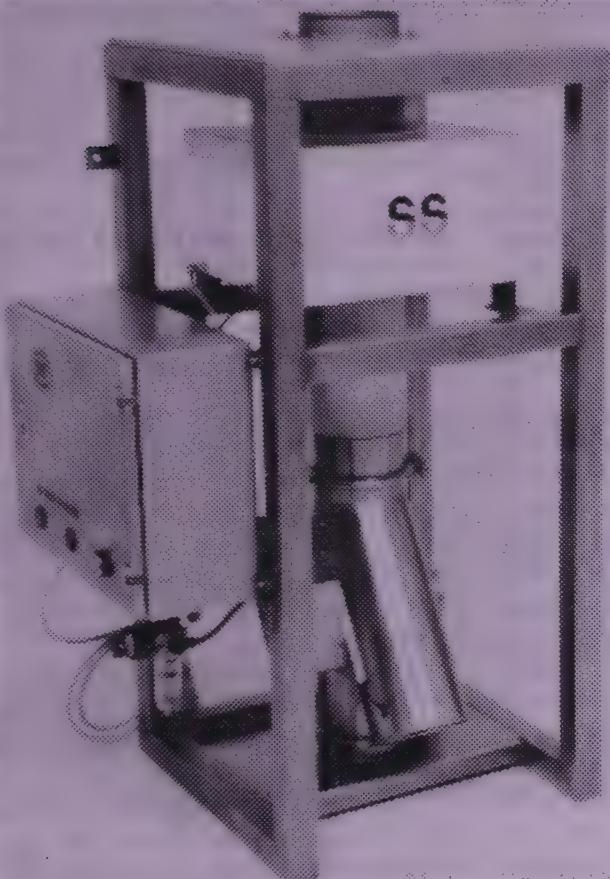
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Email: actmukesh@yahoo.com

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The "MGI" counter Pressure Filler System is a unique Pneumatically operated one man factory for manufacturing Soda / Soft drinks in any size of PET / Glass bottles. The system is available with 2 or 4 filling heads.

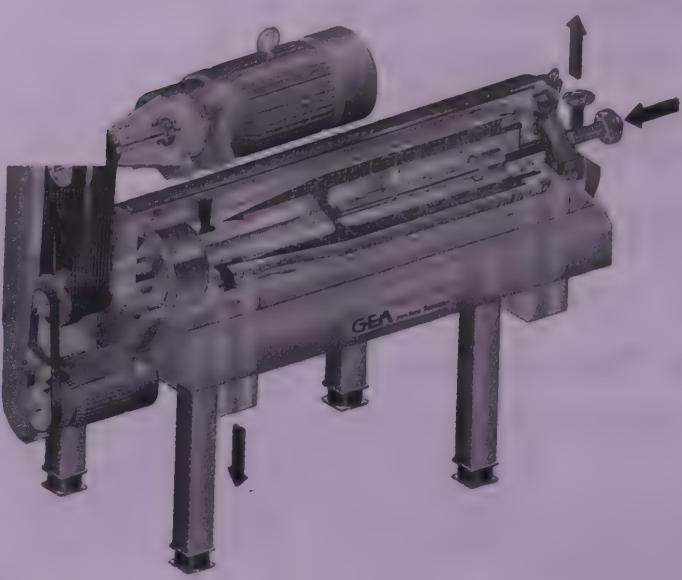
Pump, Carbonator & Regulator: It consists of a motor driven double acting high efficiency pump feeding a stainless steel carbonator designed for better gas water mixing. Special internal construction inside carbonator ensures that the water passing through it is saturated automatically. A regulator is provided to constantly monitor the pressure of CO_2 gas, ensuring uniformity in the quality of carbonated water. It also protects the carbonator from high pressure. A safety valve on the regulator releases excess pressure developed into the atmosphere.

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The Unique advantages of counter pressure filling system 1) Quality of soda is very high 2) Wastage of soda / soft drink is nil 3) Level of liquid filling is even 4) Easy pneumatic operation.

Other Important Features of the Machines: • The carbonator is designed to give better gas volumes at low pressure, which means saving on costly raw materials and low wear and tear of the machine • The pump and non-return valves are designed to give maximum output without any loss of efficiency • The filling head gives maximum efficiency and instances of bottle breakage are practically nil • The whole machine is compact and

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The company also manufacturers O.T.S. Cans and general tin, cans and

being allowed to stand beforehand. The pressure forces the grapes against the wall of the bowl and separates the must from the solid contents. The mash flows continuously into the decanter. Must is also continuously discharged and can then be fermented by the cellar master. The remaining pomace is discharged from the decanter bowl by a scroll rotating with a differential speed. The result is impressive and tasty. The must has an optimum colour and taste. The low level of turbidity means that it is now no longer necessary for further treatment to be carried out in the form of clarification.

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For more details, contact:

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(F.R. Germany)
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Fax: +49 (0) 25 22 / 77-24 88
Email: info@gea-westfalia.de
Website: www.westfalia-separator.com

can easily installed in a comparatively small space • The production of the machine is 45-50 dozen bottles of 500ml size per hour, depending on the dexterity of the operator.

Standard Accessories: • Set of spanners, screw driver and oil can • Extra set of washers • Services instruction and space parts manual.

Optional Accessories: • When the machine is power driven the following accessories are given as an option - 1Hp motor with "A" section "V" belts and starter • For soft drinks, a syrup pump and SS tank can be attached separately.

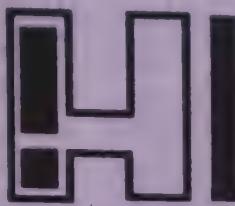
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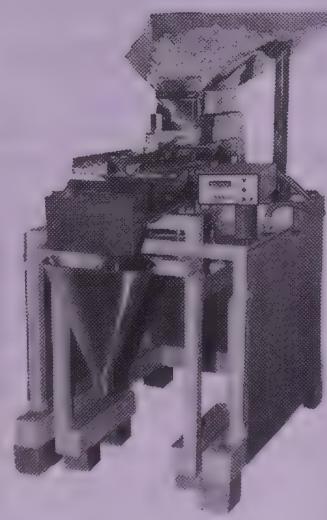
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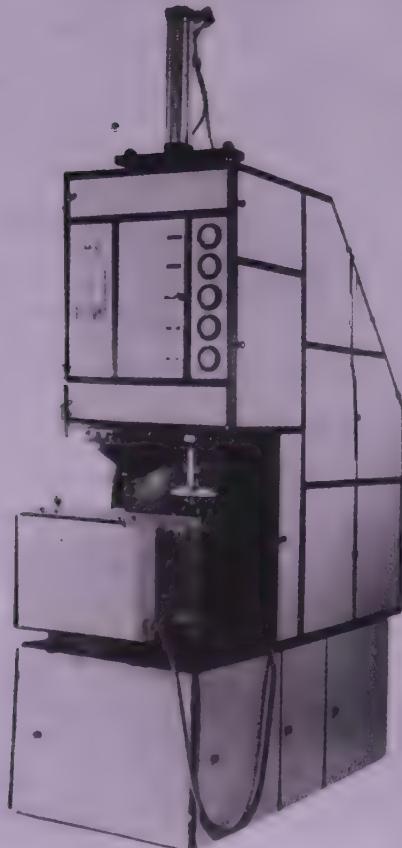
This unique colour is brought to you by Sayaji Sethness Ltd. a joint venture company promoted by Sayaji Industries Ltd. (Ahmedabad) and Sethness Products Co. (U.S.A.) to manufacture Caramel Colours. Sethness Products Company is a dedicated caramel manufacturer since 1880. Today they have developed and standardized the manufacturing process to obtain a product that meets the highest standards. Their rich experience combined with their R&D back-up is available to bring to you the best product available to meet possible range of colour, strength and hue.

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Ahmedabad 382410
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For more details, contact:

Poly Tech
A-7, Aggarwal Industrial Estate Chitalsar
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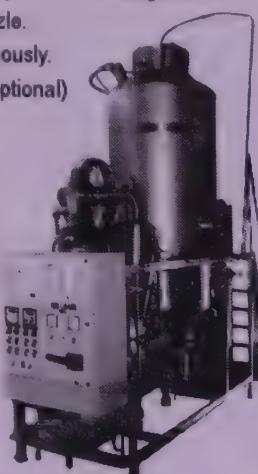
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Reference List

Sulphur Mills Ltd., Mumbai,
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FOR PET BOTTLES

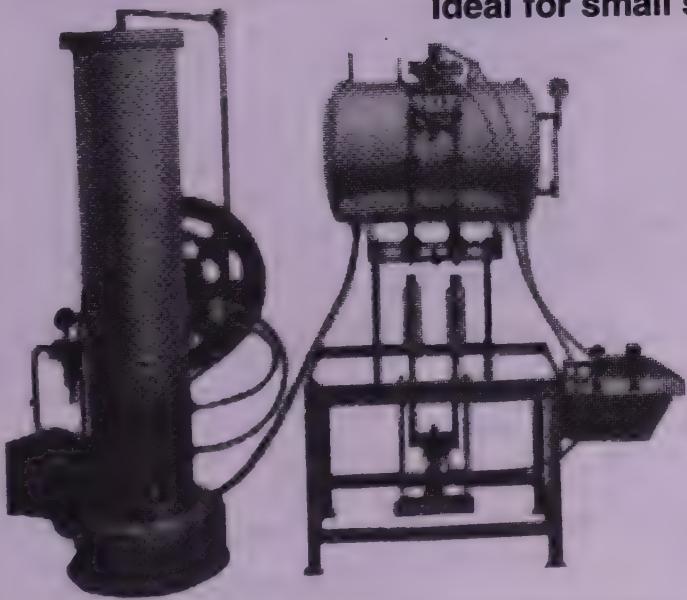
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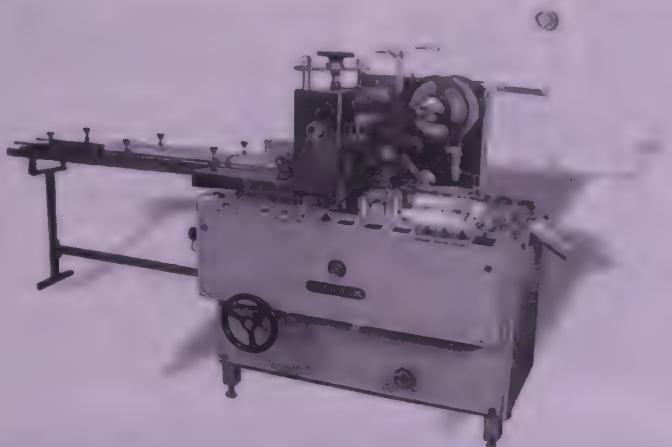
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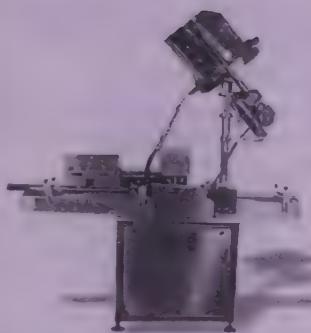


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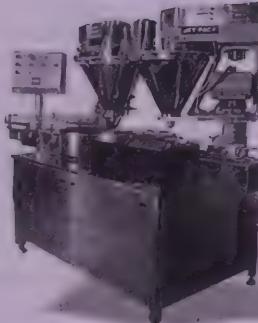
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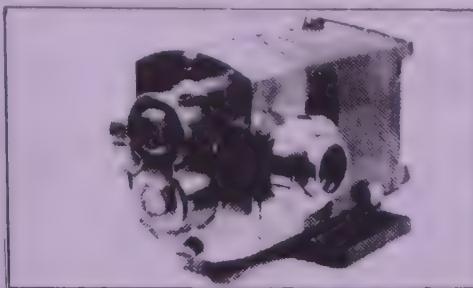
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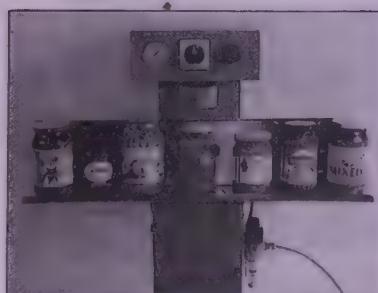
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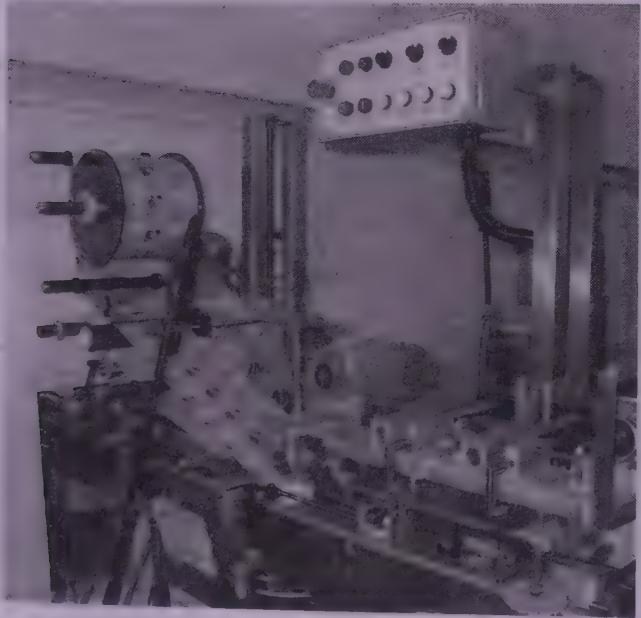
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LABELLING SYSTEMS



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Graham Labelling Systems

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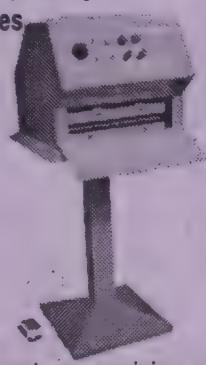
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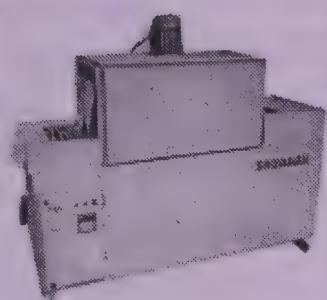
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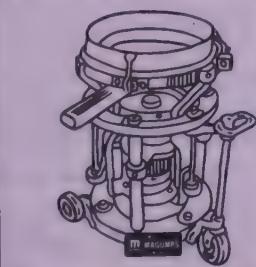
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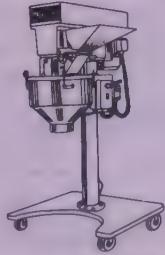
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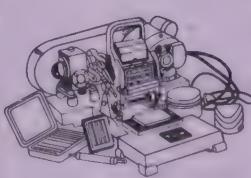
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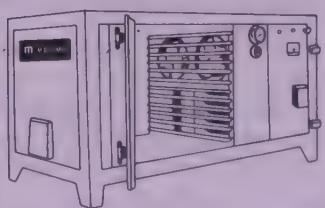
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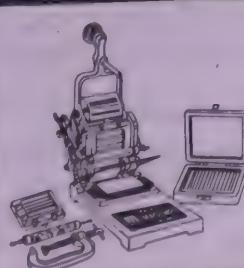
MULTI MILL



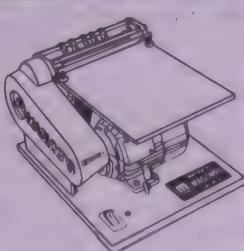
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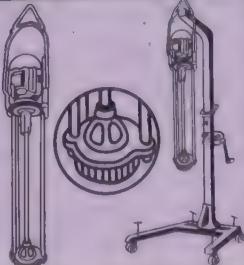
DRYING OVEN



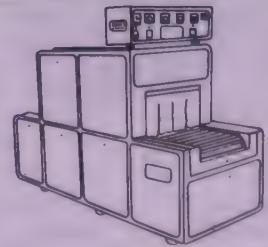
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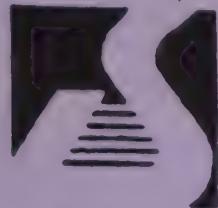
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The machines have special bearings for smooth working and the gears are made of steel for jerk free operation. The machines are mobile.

For more details, contact:

Krishna Sales Corporation (Regd.)
108, Joshi Road, Karol Bagh
New Delhi 110 005
Tel: 3521211, 7776338

POTATO / PAPITA PEELING MACHINE



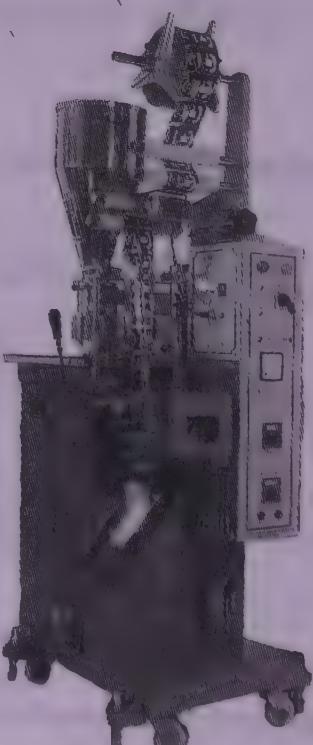
Hari Om Industries are manufacturers of various kinds of Food Processing ma-

CONVEYOR & PROCESSING BELTS

Habasit Iakoka is a joint venture company with Habasit AG, the world leaders in Power Transmission Belts & Conveyor Belts. The conveyor belts are mainly for indoor applications in Textiles, Paper, Printing & Packing, Materials Handling, Airport and Food Industries.

Habasit offers a wide range of conveyor and processing belts for the Food Industry. These conveyor belt covers are made of high-quality polyurethane. Microbial infestation is an unknown term, same as dust or test alterations due to chemical plasticizers. Habasit belting meets the specifications of the US Food and Drug Administration FDA and of the US Department of Agricultural USDA.

FORM-FILL-SEAL MACHINE



chines under brand name "Krishna". The potato/papita peeling machine has been manufactured with the latest technology. The machine can peel 500 kg of potato per hour.

The machine is made from 18 gauge S.S. Aluminium body coverage which makes it durable & strong with Two year warranty in affordable marketing price. No Pulley belts with Emry in surface.

* Height of the models available in 90 cm x 55 cm and 38 cm x 36 cm respectively * Eprox weight: 78 kgs.

For more details, contact:

Hari Om Industries
Dhebar Road (South)
Atika Ind. Area, Street No. 3
Near Jaydev Foundry
Rajkot 360 002
Tel: 363620
Fax: 0281-371745 (R) 371438

Habasit Iakoka Pvt. Ltd. at Coimbatore is having stock of Mother Roll of Habasit Conveyor Belts imported from Switzerland. The company has the capability of making Endless Conveyor Belts on the spot upto the width of 3 Mtrs.

The company also is having the offices at Mumbai & Delhi and the Service Engineers are available for consultant, grade selection and assistance for installation whenever the customer wants.

For more details, please contact:

Habasit Iakoka Pvt. Ltd.
Opp. Goldwin Civil Aerodrome Post
Coimbatore 641014
Tel: 0422-827879 • Fax: 0422-82721
Email: habasit.iakoka@habasit.com

The fully automatic vertical form-fill-seal machine from Gurdeep Packaging finds application for packing any free flowing powder and granules, spices, soup concentrates, soft drink concentrates, pharmaceutical powder, detergents, tea/coffee, pan masala, supari, confectioneries etc.

Specifications: Sealing Type: 3 side sealing/4 sides sealing. Packing Size: 50-120mm, or 100-240mm (film length), 20-160 mm, or 20-220 mm (film width) (enlarged type can be made upon order). Speed: 45-90 bags/min, 60-120 bags/min (Depending on flowing rate and volume of packing objects). Packing Material: All heat sealable laminate PET/POLY, PET/FOIL, POLY MET, PET/POLY/CPP/OPP etc...

For your requirements, contact:

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Fax: 91-22-5772846

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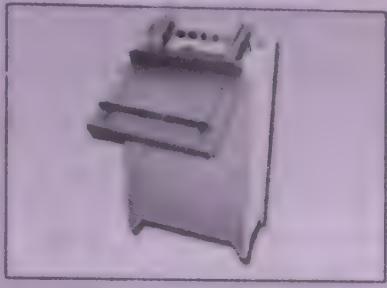
CONTINUOUS SEALER MACHINE
WITH GAS FLUSHING
ATTACHMENT



SHRINK WRAPPING MACHINE



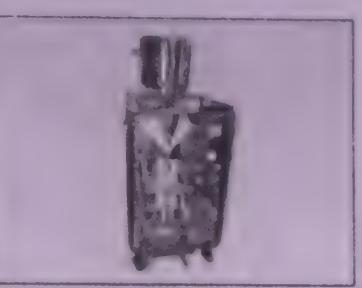
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- Fill Range : 50 ml to 5 Ltrs.



Other Models:

- Higher speed models on request.



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AUTOPACK

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For further details, contact:

Kaptan's Vistas Engg. Pvt. Ltd.
103 Jagruti Indl. Estate, 771 Mogul Lane
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Mumbai 400 016
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Fax: +91-22-430 1913
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FABRICATED POTATO CHIPS LINE



The impressive taste and innovative shape of fabricated potato chips have fostered an exponential worldwide growth in consumer demand for this type of product.

Pawan has developed a complete process system for the fabrication of the stackable chip which is technologically sound and able to produce a first rate product.

The raw materials, mainly consisting of potato based ingredients (granules, flakes, potato flour and modified starches), are blended and introduced into the mixing tank by means of gravimetric dosers.

The hydration liquid, where the minor ingredients such as salt, glucose, etc. are dissolved, is injected into the same tank at a constant ratio to the solids input.

The homogeneously hydrated dough is then transferred to a multi-rolls sheeting system where a continuous sheet is formed and calibrated to the desired thickness. The chips are then cut from the sheet and the scrap web is chopped and returned to the mixture tank for re-use.

The properly oriented chips are transferred to the frying operation where the dough moisture is evaporated and the product takes on an expanded and crunchy structure. The uniform single curve shape is achieved thanks to the use of a special conveyor that maintains the chips in the required shape during frying. Upon discharge from the fryer, a dispensing system applies seasoning onto the chips.

In the packaging section, the chips are single stacked into continuous rows. A set of volumetric loading devices create the stacks which automatically pass through an automatic seamer that injects an inert gas to improve the shelf life of the fabricated potato chips.

The packaging may be customized can, tub, flow-pack, etc.

For more details, contact:

Dr. T.K. Food Consultants Pvt. Ltd.
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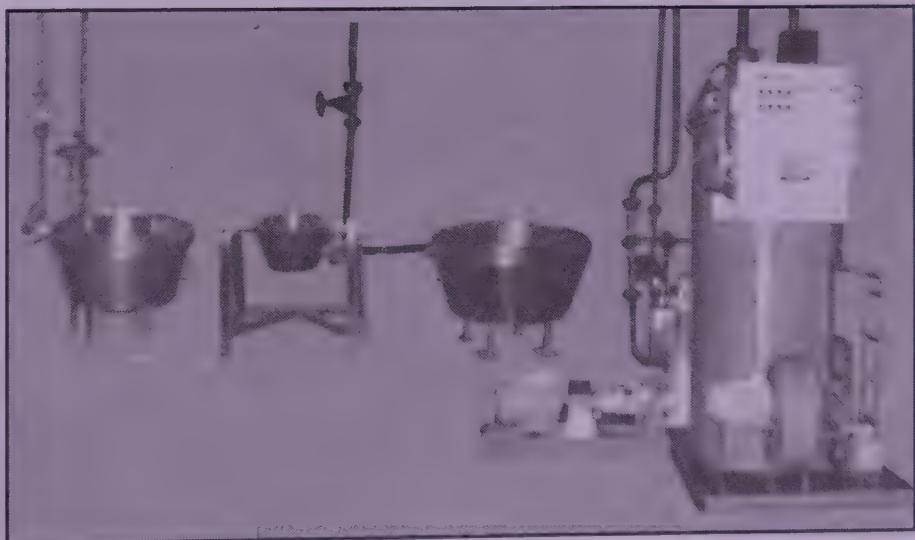
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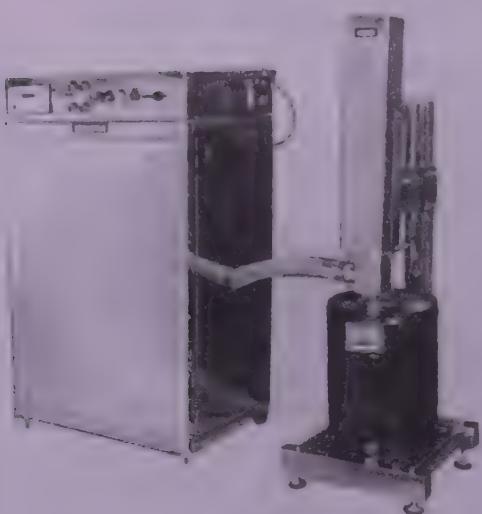


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For more details, contact:

Spanpak Systems
B-136, Ghatkopar Industrial Estate
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Ghatkopar (W), Mumbai 400 086
Tel: 5007184, 5007144
Fax: 5008352
Email: spanpak.filling@axcess.net.in

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For more details, contact:

Arun Engineering Works
61, off Dr. E. Moses Road
Leach and Weborn Compound
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Worli, Mumbai 400 018
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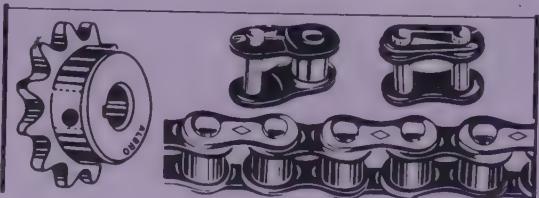
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Established in 1966 by Mr. H.N. Gogia, Gogia Chemical Industries is a pioneer in orange oil cold press. They meet the requirements of all the major flavours and fragrances houses.

The Company started the manufacturing of flavours a few years later and received a very good response from the market.

It is now one of the leaders in food flavouring and is associated with quite a large number of Industrial houses, having a clientele of over 2000 in the domestic market which include manufacturers of confectioneries, fast foods, pharmaceuticals etc.

Presently, the company is manu-

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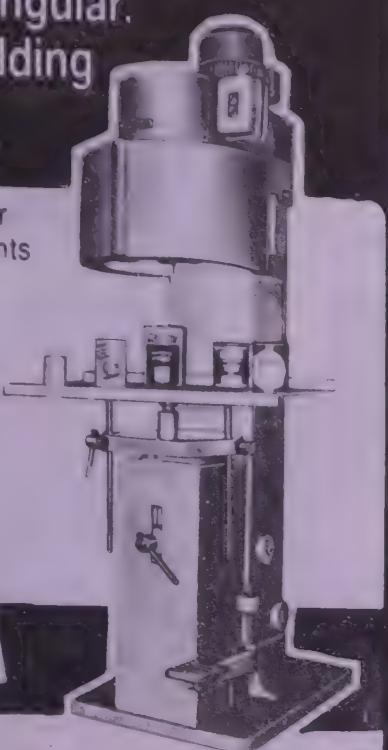
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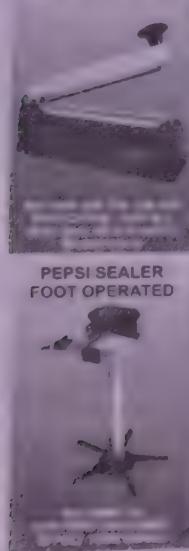
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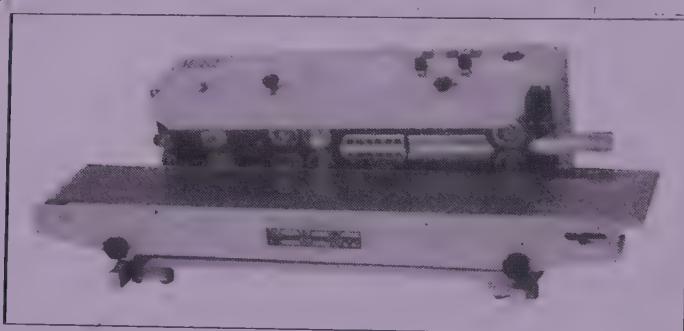
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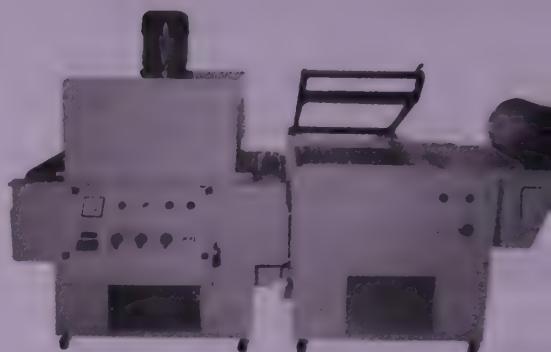
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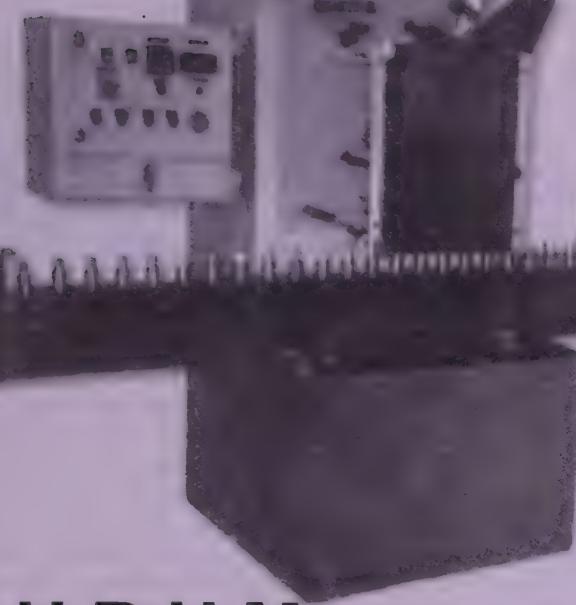
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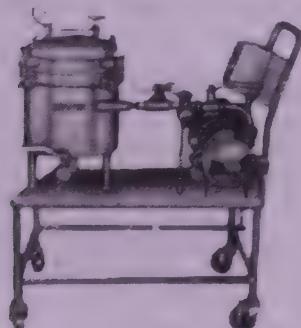
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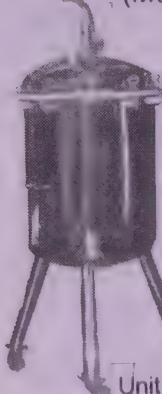
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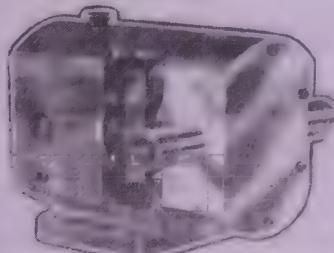
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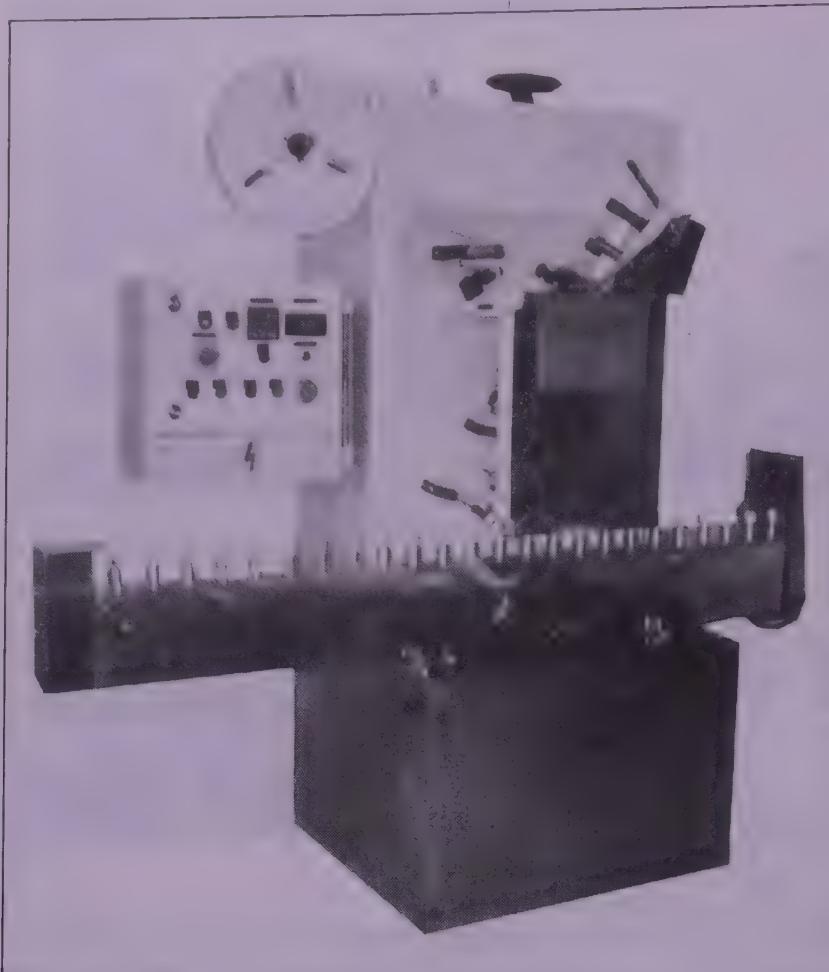
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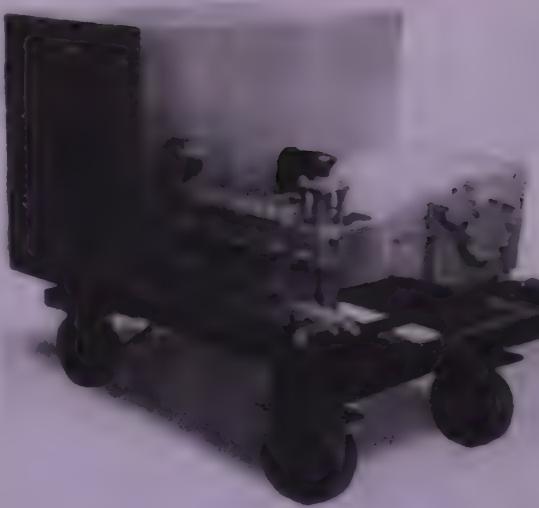
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BOOK REVIEW

CAREERS IN FOOD INDUSTRY MANAGEMENT authored by Professor Joseph H. Hulse and Published by Central Food Technological Research Institute, Mysore 570 013, Fax: 91-821-516308, Email: prakash@cftri.com, Pages 92, Price Rs 300.

The book is based on lectures presented by the author to students at the International Food Technology Training Centre in Mysore. The book is a comprehensive manual on the principles and practices of industrial and corporate management. It is an introduction to food and related industries. The book is specifically for graduates in Food Science and Technology who anticipate a career in food industry management. The text is the author's personal observations and opinions.

MANAGEMENT OF SMALL AGRI-BUSINESS also by Professor Joseph H. Hulse – President of Siemens – Hulse International Development

Associates Inc., Ottawa, Canada and Visiting Professor at Rural Agri-industrial Development, Swami-nathan Research Foundation, Chennai, Published by Central Food Technological Research Institute Mysore 570013, Fax: 821-56308, Email: prakash@cftri.com, Pages 20, Price 30.

The book is written to help people who are committed to or considering to start a small agribusiness company. It covers planning, resources both human and financial, budgeting, market research, expansion and diversification.

The author professor Joseph H. Hulse was former chairman, Interunion Commission on Application of Science to Agriculture, Forestry and Aquaculture, International Council of Science Unions Ottawa, Ontario Canada.

ALL INDIA DAIRY BUSINESS DIRECTORY, Published by Sadana Publishers

& Distributors, FF-20, Palika Bazer G.T. Road, Ghaziabad 201009. Tel: 4795783, Fax: 0120-4724818, 4716839, Email: dairyyearbook@hotmail.com, Website: dairyyearbook.com, Pages 1325, Price Rs. 2465.

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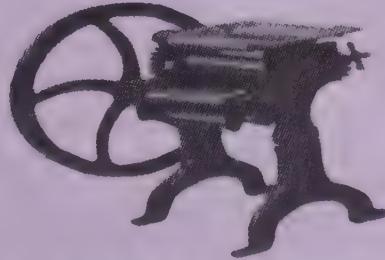
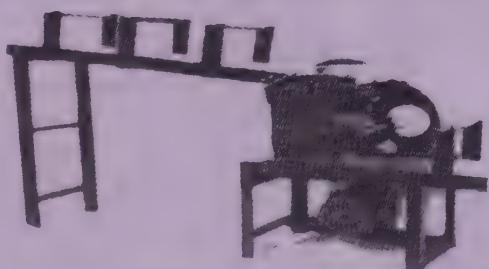
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Products: * UV Water Disinfection Systems * Air Purifiers * Filters * Water Treatment Plants * Bottling Plants

INDIAN TRANSPORT ORGANISATION, 305, Ashirwad Building,

Ahmedabad Street, Masjid (East), Mumbai 400069. Tel: 3750825/0843, 6393396/3791, Fax: 3756353, Email: ito@vsnl.net

Services: Transport (Express/F.T.D) all over India * Packing facility also available.

J.K. MALT PRODUCTS PVT. LTD., 61&66, GIDC Estate, Nadiad - 387001, Gujarat. Tel: 0268-62691-95, Fax: 62696-97 Email: jkmalt@icenet.net

Products: Malt Extracts IP (Liquid & Powder)

JANAK DEHYDRATION PVT. LTD., P.B. 58, Keri Bazar, Old Darbargadh, Mahuva 364290 (Dist. Bhavnagar), Guj. Tel: 02844-27763/64/65, Fax: 02844-24265 **Mumbai Mktg. Off.:** Tel: 8074436/8061113, Fax: 022-8612735 Email: jkmehta@bom5.vsnl.net.in

Products: * Dehydrated Vegetable Products such as Onion, Garlic, etc. Free flowing Powders of dehydrated Onion and Garlic

JET PACK MACHINES, C-18, Nandjyot Indust. Estate, Safed Pool, Kurla-Andheri Road, Sakinaka, Mumbai 400072. Tel: 91-22-8516489, 8515561, Fax: 8516489, Email: jetpack@vsnl.com

Products: * Packaging Machines for Powder, Cream / Paste and Liquid Filling Machines * Horizontal Flow Wrapping Machine * Granules Filling Machine * Capping Machines * Batch Coding Machines * Neck Sleeving Machine * Insert Sealing Machines * Carton Overwrapping Machines * Sealing Machines

K. RAHEJA MERCANTILE CORPORATION, 108, New India Indl. Estate, Off Mahakali Caves Road, Andheri (E), Mumbai 400093. Tel: 8382032/1529, 8394665/4666, Fax: 8363458, Email: sales@krahejacontainers.com, Website: http://www.krahejacontainers.com

Products: * Thin Walled Plastic

Containers

KAIZEN ENTERPRISES, A/5, Trupti, G.V. Scheme Road #4, Mulund (E), Mumbai -400081. Tel: 5646873, Fax: 5646873, Email: kaizen@zeenext.com

Products: * Weigh-Fill Machine

KAMANI OIL INDUSTRIES, 317 Puran Asha Building, Narsi Natha Street, Mumbai 400 069. Tel: 343 5968, Fax: 3435964, Email: kamani@bom2.vsnl.net.in

Products: * Refined Vegetables Oils

KAPTAN VISTAS ENGG. PVT. LTD., 103, Jagruti Industrial Estate, 771 Mogul Lane, Mahim (W), Mumbai 16. Tel: 4327985, 4362539, Email: kaptansvistas@vsnl.net

Products: 'Maso' brand Food Pumps

KOMAL INDUSTRIES, 108 Creative Ind. Centre, 12 N.M. Joshi Marg, Lower Parel, Mumbai 400011. Tel: 91-22-3091090, 3091174, Fax: 3062711, Email: kcc@giasbm01.vsnl.net.in

Products: * Water Treatment Plant * Water Demineralisation Plant * Mineral Water * U.V. Disinfector * Drinking Water System * Micron Filter * Ozonator * Water Softening Plant * RO Systems * Water Filtration Plant * Water Purifier * Dosing System

KONARK MACHINE TOOLS, A-207, Anand Complex, Near Sola Bridge, Thaltej, Ahmedabad 380054. Telefax: 079-7493537, Email: konmac@wilnetonline.net, Website: www.konarklabelling.com

Products: * High Speed Automatic Labelling Machine no KHL-150.

KOVITINS, 21, Nandlal Ramroop Estate, Ram-krishna Mandir Road, Andheri (E), Mumbai 400059. Tel/ Fax: 8230095

Products: Bakery Equipment

KRISHNA SALES CORPORATION (REGD.), 108, Joshi Road, Karol Bagh, New Delhi 110005. Tel: 011-35212111, 7776338

Products: * "Krishna" brand Noodle making Machine

KUMAR PROCESS CONSULTANTS & CHEMICALS PVT. LTD., 4&5, Bhagtni Enclave, Sonapur Lane, Off L.B.S. Marg, Bhandup (W), Mumbai 400 078. Email: kumarfil@bom3.vsnl.net.in

Products: * Polishing Filters for Solvents, Aqueous Solutions, Injectables * Membrane Holders * Liquid Filters upto 0.1 Micron * Air Filters upto 0.01 Micron * In-Line Conical Filters Micron * S. S. Lab Filters * Filter Cartridges & Discs * Filter Housings

LAB INSTRUMENTS, 9, Ratnadeep, 78-B, Jagannath Sankar Seth Road, Mumbai 400004. Tel: 3690973, 3681316, Fax: 3690973

Products: * Laboratory Equipment & Appliances e.g. * Spectrophotometer * Electronic Balances

* Ion Analyser * Tintometer * Brook Field Viscometer * Centrifuge * pH Meter * Conductivity Meter * Polarimeter * Refractometer * Stirrers * Emulsifiers * Hot Air Ovens * Heating Mantles * Filter Paper * Borosil Glassware * B.O.D. Incubator * Moisture Meter

LITHOTECH ENGINEERS, Sector 10, B-25, S-2 Shantinagar, Mira Road (E), Thane 401107. Tel: 8110182, 8113648, 8113617, Telefax: (95250) 392410, Email: lithotech@vsnl.com

Products: * Masala Mill - Grinding * Chillies * Turmeric * Coriander * Mix Masala * Dehydrated Onions * Garlic * Ayurvedic * Other products

LUCAS ELECTRONICS, B2/5, Mapkhan Nagar, Near fire Brigade, Marol Naka, Andheri (E), Mumbai 400059. Tel: 821 3660, Telefax: 8501265, Email: lucasg@bom2.vsnl.net.in

Products: * Continuous Sealer Machine with Gas Flushing Machine * Shrink Wrapping Machine * Cap Sealer Machine * Vacuum + Nitrogen Flushing Machine * Motorised Pepsi Sealer Machine * Mineral Water Pouch Sealing Machine

LUCID COLLOIDS (Indian Gum Industries), 401, Navbharat Estate, Zakaria Bunder Road, Sewri (W), Mumbai 400 015. Tel: 415 8059, Fax: 415 8074/75

Products: * GuarGums * Modified and Derivated GuarGums * Hydrocolloids Blends * Stabilizers for Food, Feed and Pharmaceutical Applications

M. SON INDUSTRIES, D-33, Sector-2, Noida 201 301, U.P. Telefax: 011-8-455 2177, 453 8397 (R) 011-8-453 6955, 454 3199, Email: mson@nda.vsnl.net.in, msons2002@yahoo.com, Website: www.food.machines.com

Products: * Roasting Plants * Ready To Eat Snack Plant * Conveyored Roasters & Driers * All Types of Mixers & Pulverisers * Potato Peeler * Steam Jacket Kettle * Steam Retard * S.S. Storage Tanks * Crown Corking Machines * Rotary Roasters * Dal Driers * Papad Plant * All Types of Extruders * All Types of Conveyors for Material Handling * Chappati Making Plant

M.G. INDUSTRIES, 218, Ranga Konar Street, Near Kattoor Market, Kattoor, Coimbatore 641 009. Tel: 232867, Fax: 0422-235297, Email: mgi@vsnl.com, Website: business.vsnl.com/mgi

Products: * Aerated Watermaking Machinery * PET Bottle Machines * PET Bottle Machines * PET Bottle Capping Machine

MAGUMPS, Trisandhya 'A' Bldg., 97, Dadasaheb Phalke Rd., Dadar (E), Mumbai 400014. Tel: 4113572, 4154474, Fax: 91-22-4137648, 4138307, Email: magumps@bom5.vsnl.net.in

Products: * Label Gumming Machine * Batch Printing Machines * Liquid Filling Machines * Bottle Brushing & Washing Machines * S S Tanks * Ovens * Blenders * Mixers * Bottle Filling/Sealing Machines * Sieving & Sifting Machines * Machinery, Fruit & Vegetable Processing

MALHAR INDUSTRIAL ASSOCIATES, Regd. Office: B-3, Harish Ind. Compound, Royal College Road, Penkar Pada, Mira Road (East), Dist. Thane 401104. Tel: 6902332, Fax: 8100348, Email: malharsweets@vsnl.net

Products: * Indian Sweet Meat manufacturing machines.

MASTECH, Cyril Niwas, Near Yashasvi Nagar, Balkum, Thane (W), Mumbai. Tel: 5414821, Fax: 5414560, Email: mscyril@hotmail.com

Products: * High Pressure

Homogeniser * High Pressure Reciprocating Pumps * Ice Cream Plants & Equipments * Milk shake & Ice slush Machines.

MEVISH ENGINEERING WORKS, K.B.M. Compound Unit, B-9, Near Ashok Nagar Complex, Marol Military Road, Andheri (E), Mumbai 72. Tel: 8504375, 8574376

Products : Filtration pumps, Centrifugal, Monoblock pump * Rotary Gear Pump * Gear Pump * Lobe pump * Liquid Filling machines * Turn Table

MICRON ENGINEERING GROUP, 1063 Bhandup Industrial Estate, Pannalal Silk Mill Compound, L.B.S. Marg, Bhandup (W), Mumbai 400 078. Tel: 561 8278/580 5416, Fax: 568 1470, Email: micronhomogeniser@hotmail.com

Products : * Filling Sealing Machines for viscous/liquid products * Homogeniser for Dairy and Beverages * Rotary Indexing type filling & sealing machines * Crate washer * High pressure pumps

NATIONAL SPICES & DEHYDRATES, Khasra No. 1110, Gali No. 18, Plot No.3, Firni Road, Village Rithala, Delhi 110085. Tel: 011-3935477, 3932594, Fax: 011-3922172, Email: spl@mantraonline.com, greenfields@mantra mail.com

Products: 'Green Field' brand Spices * Dusting Flavours * Seasoning

NEEL BIOTECH PVT. LTD., S/3 Navrang, Swastik Cross Road Navrangpura, Ahmedabad 380009 Tel: 91-79-642 6971, 656 8012 Fax: 656 2199, Email: nbo@dewang.com / dcorp@vsnl.com

Products: * Food Processing Machinery * All Equipment Comply with HACCP Standards

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Products: 'Nimach' brand fully automatic high speed label code printing machine Type AU1 * Carton Printer Machine Type AU2

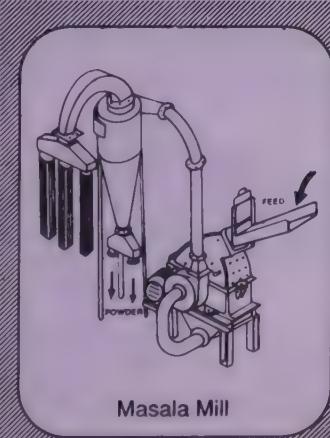
NOVA FLAVOURS & FRAGRANCES (P.) LTD., 301 Sterling Estate, 3rd Floor, Plot No. 8, Ramchandra Lane Extn., Kachpada, Malad (W) Tel: 844 6405, 8446481, Tel/Fax: 8812059, Email: hopl@bom5.vsnl.net.in

Products: * Flavours Liquid & Powder * Emulsions and Pastes * Culinary Essences * Essential Oils

P. M. VORA & CO., Ramesh Chamber, First Floor, 14 Garibdas Street, Vadgadi, Mumbai 400003. Tel: 3438487, Telefax: 3445367, Email: hopl@bom5.vsnl.net.in

Products: * Food Flavours & Colours * Food Chemicals * Citric Acid * Soya Lecithin

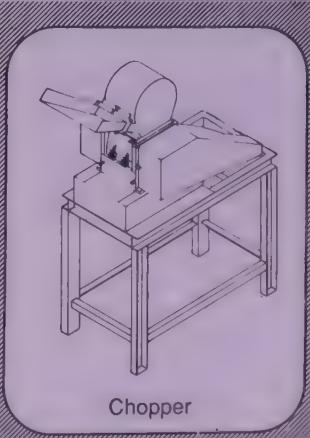
PRS TECHNOLOGIES PVT. LTD., D-26, Second Floor, N.D.S.E.



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Works: 7 Poonam Ind. Estate, Navghar Vasai Road (East), Thane 401201 Telefax: (95250) 392410

Part II, New Delhi 110 049. Tel: 6252176/77, Fax: 011-6252178, Email: info@prs-technologies.com
Products: * Machinery & Complete Plants on a Turnkey Basis for Dairy, Fruits, Vegetables, Meat, Sea Food, Bakery, Spices, Herbs, Nuts, Snackfood.

PARAG ENGINEERS, B-7, Trimbakkar Estate, Street No.22, opp. V.I.P. Co., Nr. Rota (India) Ltd., M.I.D.C. Andheri (E) Mumbai 400 093. Tel: 8234215/0738, Fax: 8262291

Products: * Food/Beverage Lobe-Bump Pumps

PARDES DEHYDRATION CO., Purvalaya Bldg., 14/15, Ram Krishna Nagar, Rajkot 360002. Tel: 281-465878/91, 285-23034, Fax: 281-224455, 2825-22652, Email: pardesind@yahoo.com, almighty@ad1.vsnl.net.in

Products: * Processors and Exporters of Dehydrated Vegetables * Dehydrated Onion, Garlic, Mint, Green Chilli, Tamarind and Ginger in Flakes / Powder / Minced / Granules / Toasted & Chopped form.

PARKSAN FILTERS P. LTD., 3, Saraswati Industrial Estate, Navghar, Vasai Road (E), Dist. Thane 401210. Tel: 0250-391413, 390818, Fax: 8995838, Telefax: 335818, Email: parksan@bom5.vsnl.net.in, Website: www.parksanfilters.com

Products: * S.S. Filtration and Process Equipment for Pharma-

ceuticals, Chemicals, Foods & Beverages and Breweries Industries

PHARMACONCEPT, 203, Malwa, Patanwala Estate, L.B.S. Marg, Ghatkopar (W), Mumbai 400086. Tel: 5003400/6777, Fax: 022-5001358 Email: sis@bom3.vsnl.net.in

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Products: * Foodgrade Chemicals * Flavours * Essential Oils * Aromatic Chemicals

PRAJ INDUSTRIES LTD., Praj House, Bavdhan, Pune 411021. Tel: (outstation) +91-2139-51511, 52214, Fax: +91-2139-51718, 51515, Email: ethc@praj.net, Website: http://www.praj.net

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Website: www.princemultiplast.com

Products: * Crates & Blow Moulded Containers

PROCESS PRECISION INSTRUMENTS, 3, Ground Floor, Poddar Bldg. No. 1, Near Sandhurst Road, Rly. Stn., Mumbai 400 009. Tel: 372 0507, Telefax: 375 1572, Email: ppibom@vsnl.net

Products: * Grado" brand Universal Indicators & Controllers

R&D ENGINEERS, A-41, IDA Kukatpally, Phase -II, Road No.4, Via I.E., Gandhi Nagar, Hyderabad - 500 037. Tel: 3079121, 3079878, Fax: 040-3078668, Email: randengg@hd1.vsnl.net.in, Website: www.rnd.wafers.com

Products: * Automatic/Semi Automatic Baking Machine Cream Wafer Biscuit & Icecream Cone making Machine

R.D. SINGHAL & CO., A-81/2, Wazipur Industrial Area, Delhi 110052. Tel: 011-7242692, 7241958, 7125654, Fax: 011-7187224.

Products: * Nitrogen gas/Vacuum Sealer * Shrink Tunnel * Shrink Tunnel with L sealer * Shrink Wrap Chamber * L-Sealer

R.G. GLASS INDUSTRIES, 11-B, Petwalla Compound, 244, Maulana Azad Road (North), Opp. Urdu Times, Near Nagpada Junction, Mumbai 400008. Tel: 3072326, 3086984, 3099896, 3096218, Fax: 91-22-3010223, Email: rgglass@vsnl.com

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Water/Soft Drink Bottles * Plastic 8 Wooden Crates * Empty New Glass Bottles in White, Amber & Green

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Products: * 2 Wire Transmitters * Programmable on/off controllers * Thermocouples RTDs * PID Controllers * Universal Calibration * Flameproof Instruments * Proximity Switches * 3½, 4½ Digit Controllers * Loop Powered Isolators displays * Timers Counters with memory * Signal Conditioners * Multizone Scanners, Controllers

RAJ PRODUCTS AND EQUIPMENT PVT. LTD., P.O. Box 8075, Mumbai 400 056, India. Tel: 816 2250, Telefax: 816 2750, Email: foramfod@bom5.vsnl.net.in

Products: * Cap Sealing Machine

RAJAT ELECTRONICS, 3704, Street Lohewali, Charkhe Kialan Chawri Bazar, Delhi 110 006. Tel: 011-3914772/3742, 3963799, Fax: 011-3915525

Products: * Packing & Sealing Machines

RAKIRO BIOTECH, Unit-1, New Modela Indl. Estate, Behind Automatic Electric Co., Padwal Nagar, Wagle Estate, Thane - 400 604, Tel: 5836846, Fax: 5651808

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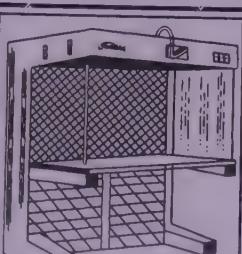
RECON MACHINETOOLS PVT. LTD., 37, Sarvodaya Industrial Estate, Mahakali Caves Road, Andheri (E), Mumbai 400093. Tel: 8343931/4973/1753, Fax: 91-22-8361074, Email: recon@bom3.vsnl.net.in

Products: * Powder Filling Machines, Liquid Fill

RIDDHI SIDDHI GLUCO BIOLS LTD., P.B. No. 9, Falls Road, Gokak 591307, Belgaum. Tel: 08332-29240, Fax: 08332-26721, Email: rssgkk.mkc@rme.sril.in, gkk@rsgbl.com

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Products: * Speciality Ingredients

SADANAND APPROTECH PVT. LTD., Regd. Office: B-34, Mini Nagar, S.N. Dube Road, Dahisar (East), Mumbai 400 068. Tel: 811 4536/8104143, Fax: 91-22-8100348, Email: sadanandfood machine@rediffmail.com

Products: * Indian Snack food & Namkeen Processing Equipment

SARVAIYA CHEMICALS INDUSTRIES PVT. LTD., Plot No. 2928-2/2930-1, 2929/2935-B, J-Type Area, GIDC, Vapi 396195, Dist. Bulbar, Gujarat. Tel: 0260-424941/427941.

Regd. Off.: C-3, Delite Palace, 1st Flr., M.G. Road, Ghatkopar (W), Mumbai 400086. Tel: 5114968, 5128114, Fax: 5148450/5157529, Email: sarvaiya@bom5.vsnl.net.in, Website: www.sarvaiya.com
Products: * Aqueous Extracts of Agriculture, Vegetable, Plants, Spice based Raw Materials and

Liquid, Solutions of Food Grade Chemicals

SATISH ENTERPRISES, A-3/62, Janak Puri, New Delhi -58. Tel: 011-5516904, 5535353, 5502859, Email: codaprnt@bol.net.in, Website: www.satisfenterprises.com, Fax: 555 3563

Products: * Hot Ink Rollers * Coding and Marking Machines * Rubber Stereos (Clin-che) * Coding and Marking Inks * Shipper, CG Box Coder, Online Autocoder * Compatible Injet Inks.

SAURABH ENGINEERS, 11, Upvan Co.op. Hsg. Soc. Ltd., Off. 132 Ft Ring Road, Ahmedabad 51. Tel: (O. & R.) 6765115, 6760292, Email: indvac@ad1.vsnl.net.in, Website: www.indvac.com Fax: 91-79-6765115/2740288

Products: * Packaging Machinery

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SHAH BROTHERS, Wadala Shriram Indl. Premises Co.op. Soc. Ltd., Unit No. C-32, 3rd Flr., G.B. Ambekar Road, Wadala, Mumbai 400031. Tel: 4118872/74/75, Fax: 4118869, Email: shahbros@bom5.vsnl.net.in

Products: * Analytical & Scientific Instruments * Filters * Laboratory Instruments * Filters Cartridge * Filter Paper * Filtration Units * Amesil Silicon Tubing

SHARPENN TECHNOLOGIES PVT. LTD., Shanmugananda, D-56, MIDC Behind London Pilner, P.O. No. 19, Nerul, Navi Mumbai 400706. Tel: 7907201/2/3/4, 7613871, Fax: 7907205 Email: subra@bom3.vsnl.net.in Website: www.indiamart.com/sharpen

Products: Horizontal & Vertical Leaf Filters * Flakes Driers * Rotary Vacuum Drum Filters * Agitated Nutche Filter * Centrifuges Tubular Bowl * Circular Vibro Screens * Turnkey for Oil Mills * Filtration Plants * Effluent Treatment Plant, Batch/Continuous Edible Oil Refineries * Batch Continuous distillation Plants * Invert Sugar * Recycling Plants for Tamarind Seeds * Coconut Shell

SHIRSAT ELECTRONICS, 133, Dewan Ind. Estate, 6, Navghar, Vasai (East), Thane 401210. Tel: 91-250-392946, Fax: 390793, Email: sakav@vsnl.com

Products: * Dryers * Bakery Ovens * Dehydrators * Fryers * Furnaces * Conveyor Systems

SHRIYAN ENTERPRISES, B/5, Ghanshyam Industrial Estate, Veera Desai Road, Andheri (West), Mumbai 400 053. Tel: 636 9057/6368328, Tele/Fax: 022-636 8320, Email: shriflow@vsnl.com

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Products: * Induction Sealing Machines * Volumetric Liquid Filling Machine * Drum Filling Machine * Digital Piston Filler * Capping Machine, Conveyors

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Products: * Stainless Steel 304/316 Grade Dairy fittings like Unions, Short/Long Bends, Tees with/without Unions, Plug, Butterfly, Diaphragm and Pneumatic Valves of SMS, DIN Standards * Centrifugal Pumps from 1 HP to 7.5 HP of SMS, DIN standards * Pipe Fittings like Elbows, Tees, Couplings, Hex Nipples, Hose Nipples etc. Other types of Valves like Ball, Gate, Globe from 1/2" to 4" in Investment Casting Process of BSP and API Standards.

SUNJAY TECHNOLOGIES PVT. LTD., B-11/12, Bhiwandiwalla Terrace, Gr. Flr. 618, J.S.S. Road, Mumbai 400 002. Tel: 201 6490, 201 5859, 200 4908, Fax: 91-22-

2065334, Email: sscorp@vsnl.com, Website: www.sanjayscorp.com

Products: * Analytical Instruments such as Spectrophotomer, Gas Chromatograph, Viscometer, Tintometer, Colorimeter * Analytical Balances * Syringes * Valves

TECHNO-EQUIPMENTS, Gala No. 9, Satyam Industrial Estate, Behind U.S. Vitamins, Off Bhaktakavi Devashi Marg, Govandi, Mumbai 400088. Tel: 5515640

Products: * Food Processing Machinery & Equipment

THE PALANI GROUP OF COMPANIES, 207, Oberoi Trade Centre, Oberoi Complex, Off. Malad Link Road, Near Laxmi Industrial Estate, Andheri (W), Mumbai 400 053. Tel: 6330974/0976/0973, Fax: 6325871/7941, 6361604 Email: palani@bom3.vsnl.net.in Website: www.palani group.com
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TOSHIBA (INDIA), 2/2, DSIDC Comm. Works Centre, J-Block, Shakurpur, Delhi 110 034. Tel: 7108890, 7184490 (O) 5937591, 5165766 (R), Fax: 011-7108890, Email: toshiba@del3.vsnl.net.in
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Products: * Automatic Form-Fill-Seal Machines * Semi-Automatic Fillers and Sealers for packing liquids, powders and granules in films such as polythene, laminates etc.

UNIVERSAL TASTEMAKERS, 133, New Apollo Estate, Mogra, Road, Andheri (E), Mumbai 400 069. Tel: 8322631/8350989, Fax: 8378156, Email: universaltastemaker@rediffmail.co. Website: www.unifood.opi.com

Products: Suppliers of Mixed Seasonings like Indian Savoury Seasonings * Continental Savoury Seasonings * Chinese Seasonings * Speciality Spice * Mixes * Food Ingredients * Snack Food Raw Material

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Products: * Aromatic Chemical Flavours and Fragrances * Protein Hydrolysates * Papain

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Foodpro 2001 - Highlights

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- Technical Sessions
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- Parallel Food Festivals & Events.

Exhibition Coverage & Scope

Equipments, Technology & Machinery

- Processing Technologies & Equipments
- Food, Agro & Horticulture Processing Equipments
- Dairy Processing Equipments & Machinery
- Packaging Machinery
- Post Harvest Handling
- Refrigeration & Cold Storage
- Quality Control Systems.

Processors, Manufacturers of

- Packaged & Processed Foods
- Dairy Products
- Fruits & Vegetables
- Confectionery
- Beverages
- Bakery Products
- Marine, Poultry & Meat Products
- and many more...

Sectoral Focus

Equipment, Technology & Machinery

Processors & Packaged Food

Contract Manufacturing & Raw Materials Sourcing Forum: Food Companies/ Fast Food Chains/ Bottlers/ Hotels looking for Raw Material Suppliers will present their requirements for Sourcing

- Farm Produce, Horticulture
- Dairy (Cheese, Milk, Butter, etc)
- Meat, Marine & Poultry Products
- Agri Produce - Wheat, Rice, Cereals, Spices.

Franchising & Retail Forum: Forum for Large Companies in Food/ Related Businesses to present Franchisee Offers and Products for Retailing to Potential Franchisees and Retailers.

Technical Seminars: Proposed Seminars on

- Food Processing Technologies
- Packaging Technologies
- Food Packaging
- Cold Chain & Refrigeration Technologies
- Risk management for Agri-food Industry.

Country Level Participation from Australia with more than 20 Companies at the Exhibition.

For More Details Contact:



**Confederation of Indian Industry
(Business Fairs Division)**

35/1, Abhiramapuram, 3rd Street, Alwarpet, Chennai 600 018, India
Tel: 044-4987648/49, 4660571/70/1311/0291/0773. Fax: 044-4660312.
E-mail: j.shanker@ciionline.org / v.kuppuswamy@ciionline.org

Visit www.foodpro2001.com for further details and registration.

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Andhra Agri.com 2002 will be first of its kind of Agricultural exhibitions in this part of the country. Andhra Pradesh, the land of multiclimate regions is a leader state in growing many crops like Paddy, Tobacco, Chillies, Turmeric, Pulses, Sugarcane, Oil Palm and variety of Fruit crops including Mango, Citrus etc. With the added touch of high-tech atmosphere created by the dynamic Chief Minister Shri. N. Chandra Babu Naidu, the agricultural scenario in Andhra Pradesh in general and coastal belt in particular is buoyant. It is needless to say that business opportunities here in agricultural and allied activities like Bio Technology, Food Processing, Aquaculture, Poultry and Dairy, Agricultural Equipments etc. is highly conducive. The region of Andhra all along the coramandal coast, consisting of highly progressive and enterprising farming community, is well known for innovative agriculture where agriculturists are receptive to new ideas, methods and technologies.

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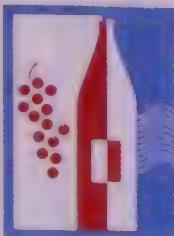
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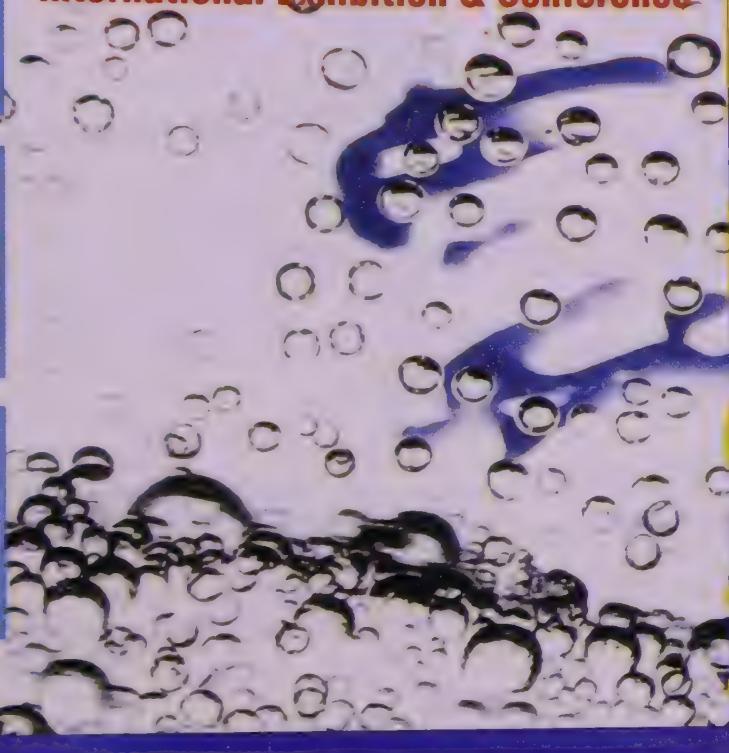
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- Packaging Machinery
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- Auxiliary Eqpt. & Services



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- Wines, beers and liquors
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INTERNATIONAL TRADE FAIRS & CONFERENCES

INTERNATIONAL ORGANIC TRADE FAIR

Venue: Tokyo, Japan
Date: 13 -15 December, 2001

Under the patronage of the International Federation of Organic Agriculture Movements (IFOAM), BioFach Japan opens its doors to the International organic market.

BioFach Japan – International Organic Trade Fair is organised by Nürnberg Global Fairs and Japanese media concern and exhibition organizer Nihon Keizai Shimbun Inc.

For more details contact:

Mr. Frank Venjakobs, Project Manager – BioFach Japan. Tel: 49 (0) 911 8606-697, Fax: 49 (0) 911 8606-694, Email: info@nuernbergglobalfairs.com, Website: nuernbergglobalfair.com

HONG KONG INTERNATIONAL FOOD FAIR

Venue: Hong Kong
Date: 24-27 January, 2002

Hong Kong International Food Fair, organized by Neway International Trade Fairs Ltd., will make its debut from Jan 24-27, 2002 at the Hong Kong Convention and Exhibition Centre. This premier event will provide a superb opportunity for local and overseas manufacturers, suppliers, agents, distributors and franchisers to get in touch with potential buyers and business partners from Hong Kong and all over the world. The fair will be the best place to explore new markets, exchange ideas as well as promote new and existing brands.

Widely recognised as the "Gourmet's Paradise", Hong Kong is the only place where the most diversified and finest Western and Oriental foods are found. Located at the centre of Asia, Hong Kong has always been the perfect location for trade and business development for the food industry. Hong Kong is also a major distribution centre in Asia and China.

The forthcoming food fair will feature new products in different Thematic Zones. Highlights will include the "Green Food", "Health Food" and "Sweets & Bakery" Zones etc. Over 15,000 quality visitors from Hong Kong, China and different parts of the world will attend The Hong Kong International Food Fair.

For more details contact:

Neway International Trade Fairs Ltd., 9/F, Fortis Tower 77, Gloucester Road,

Hong Kong. Tel: 852-2561-5566, Fax: 852-2811-9156, Email: info@neway-fairs.com, Website: <http://www.neway-fairs.com>

INTERNATIONAL SWEETS & BISCUITS FAIR

Venue: Germany
Date: 27-30 January, 2002

Organised by KolnMesse GmbH the International Sweets Biscuits Fair will be held from 27th to 30th January, 2002 at Koln in Germany.

For more details contact:

Christine Hackmann. Tel: +49(0)221 / 821-2288, Fax: +49(0)221 / 821-3417, Email: c.hackmann@koelnmesse.de, Website: ism-cologne.de

BIOFACH

Venue: Nürnberg, Germany
Date: 14-17 February, 2002

BioFach 2001 saw the euphoric mood over the extraordinary rise in demand for organic products. The next opportunity to get information about international range of organic food and natural products will be BioFach 2002 at the exhibition centre in Nürnberg from 14th-17th February, 2002. The country of the year will be Spain which will present attractive products and its culture. Over 1725 exhibitors are expected to take part and more than 25,000 trade visitors are expected.

For more details contact:

Indo German Chamber of Commerce, Maker Tower, E, 1st Floor, Cuffe Parade, Mumbai 400 005. Tel: 2186131 / 2186118, Fax: 218 0523, Email: ruby@indo-german.com

HOTERES JAPAN 2002 FOODEX JAPAN 2002

Venue: Tokyo, Japan
Date: 12-15 March, 2002

Foodex Japan 2002, the 27th International Food and Beverage trade show, will be held at Nippon Convention Center from March 12 to 15, 2002. Foodex Japan enjoys the reputation of being the No. 1 event in the Asia Pacific Rim. Foodex Japan provides essential business opportunities to penetrate the vast Asian market and for business expansion in Asia.

Hoteres Japan, which runs concurrently with Foodex Japan, is Asia's largest equipment, systems, and services exhibition for

the hospitality industry. And for Hoteres Japan 2002, the 30th International Hotel & Restaurant Show, some 80,000 visitors are expected to attend the show.

For more details contact:

The Secretariat of Hoteres Japan / Foodex Japn, Japan Management Association, Convention Div., 3-1-22 Shiba-koen, Minato-ku, Tokyo 105-8522, Tel: 81-3-3434-3453, Fax: 81-3-3334-8076, Email: convention@hoteres.jma.or.jp, concentration@foodex.jma.or.jp

PETPOINT

Venue: Essen, Germany
Date: 23-27 April, 2002

The first International Exhibition PET POINT for PET bottles, closures, crates and filling equipment will be held at Essen from 23rd – 27th April, 2002. This exhibition will run parallel to MET PACK and coincide with INTERPACK.

PET point's group stands are dedicated to recycling, dairy products, and special solutions in preforms, bottle design, closures, and labels.

The first world congress for PET is conceived as a promotion device for PET as well as the chance to exchange views and experience. Competent experts will deal with relevant topics such as technology and marketing.

Until now the suppliers of these various pieces of equipment were to be found at some widely differing exhibitions, with there being no central forum for the PET industry. At PET POINT we now intend to fill that gap, and present PET packaging in all its varied aspects. Large and small suppliers from around the world will be getting together to show their products at the first exhibition of its kind.

Exhibition Profile: • Materials for bottle and cap production • Packaging components and accessories • Raw materials for beverage production • Preform production • Bottle production • Cap and crate production • Ancillary equipment for the production of preforms, caps and crates • Moulds • Materials and accessories for moulds • Bottle handling and preparation • Beverage preparation • Filling machines • Labellers and capping machines • Downstream equipment • Recycling • Laboratory equipment • PET consultancy and support services • Contract manufacturers.

For more details contact:

PET planetPUBLISHER GmbH, Haus Isenburg, 58566, Kierspe. Tel: +49-2359-2996-0, Fax: +49-2359-2996-10, Email: brangenberg@petpla.net

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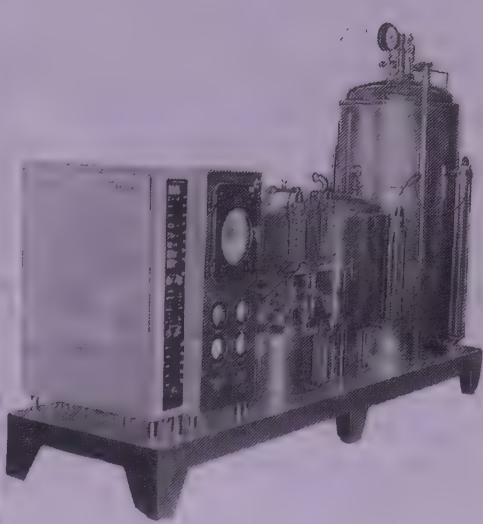
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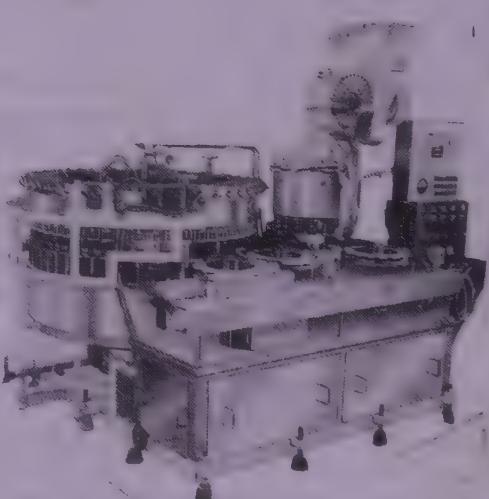
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INDIAN TRADE FAIRS & CONFERENCES

Seminar on Opportunities in Utilisation of By-products from Agriculture and Food Processing Sectors

Venue: Shivaji Nagar, Pune
Date: 5-16 Dec., 2001

A seminar is organised by Indian Society of Environmental Science and Technology (ISEST) to address the problem of environmental pollution from food processing units and also to identify possibilities for processing farm produce, utilization of agro waste for development of value added products to boost the income from agricultural sector and to take stock of problem related to environmental pollution and its control.

Lectures and discussion on various topics like • Processing of farm produce using conventional, and modern method • Scope for using radiation technology • New agricultural policy • Trade & WTO • Farm-waste utilization • Waste disposal and pollution control.

The seminar will include presentations from experienced faculty.

For further details contact:

Dr. S.G. Jadhav, Convener of the Seminar & General Secretary, ISEST, C/o Analytical Chemistry Division, Bhabha Atomic Research Centre, Mumbai 400 085. Tel: 022-5593217/5505145, Fax: 022-5505151, 5519613.

SEMINAR ON NUTRACEUTICALS & FUNCTIONAL FOODS

Venue: Mumbai
Date: 19-20 Dec., 2001

A Seminar has been organised by Association of Food Scientists & Technology (India) Mumbai jointly with Food & Fermentation Tech. Div. UDCT, Mumbai University to felicitate Professor Dinanath J. Rege on his completing 75 years. Professor Rege is an internationally renowned Food Technologist known for his research and innovative ideas for food product development.

The seminar will focus on the latest scientific research and the impact of this research on the market place, consumer awareness and attitudes, on policy and regulation of Functional Foods. A major objective of this seminar is to provide a forum for interaction among food chemists, biologists, biochemists, food sci-

tists, pharmacologists, nutritionists, medical doctors, students, marketing personnel, policy makers and interested people from private industries and government institutions. In addition, current perspectives on functional foods and its market place implications, consumer impact and regulatory issues will be discussed and presented.

Experts from reputed food and Pharma Industries, in Functional foods have been invited.

For more details contact:

Prof. S. S. Lele, Jt. Hon. Secretary – AFST (I) Mumbai Chapter Food & Fermentation Technology Div., UDCT, Matunga, Mumbai 400 019. Tel: 4145616, Email: sslele@foodbio.udct.ernet.in

AGRI EXPO 2002

Venue: Paldi, Ahmedabad
Date: 3-6 January, 2002

Agri Expo 2002 will showcase the products and services focused at the most important element of the region's economy, 'the farmer'.

It will provide an excellent platform to manufacturers and distributors of agricultural inputs to showcase their products and services and to interact with one of the most enterprising, progressive, and prosperous farmer communities of the country.

Leading lights in the fields of Agriculture, including agroforestry and animal-husbandry, and also the agro-machinery industry as well as companies providing agricultural inputs like fertilizers, pesticides, insecticides will participate in the exposition.

Main Objectives of Agri Expo 2002:

- Developing the market for technocrats and manufacturers of various raw materials used in agriculture by interaction with farmers
- To understand the problems of farmers in cultivating and solve accordingly
- Providing the practical education to the farmers
- Updating the Indian economy
- Providing A Super market of Agriculture inputs to the farmers.

Agri Expo 2002 will attract more than 100,000 farmers from all over Gujarat.

For more details contact:

Garima Communication, 12, Kajal Kiran, Srimali Society, Opp. Jain Derasar, Navrangpura, Ahmedabad 380 009. Tel: 644 6186, 640 0900, Fax: 079-642 3108.

INTERNATIONAL FOODTEC INDIA 2002

Venue: Chennai Trade Centre
Date: 9-12 February, 2002

Confederation of Indian Food Trade and Industry (CIFTI) was set up by FICCI in 1985, to cater specifically to the needs of Food Industry and Trade. Today, it is the apex body of food industry in the country providing institutional support to food trade, hotel industry and processed food industries manufacturing almost all types of food and allied products including the affiliated sectors like packaging, machinery, seed development etc.

CIFTI is the only Indian Sponsor and the organization of the event, International FoodTec India 2002 in India and will be directly co-ordinated by CIDEX, the Indian, subsidiary of Köln Messe International and Messe Düsseldorf, a joint venture initiative.

The fair will be organized concurrently with INDPACK 2002 International and INDPACK 2002 International, India's most renowned packaging and printing fairs focussing on Packaging Materials, Auxiliary Materials, Packaging Products & Components, Packaging Machinery, Converting Machinery, Printing and Allied Machines, Labelling and Coding Systems etc., which also has a huge role to play in the food processing sector.

CIFTI will also organize technical seminars on topical issues during the event, which will be addressed by the experts from the field including industry, government and research organisations and also the international speakers representing the participating companies. There will be a special Indian Processed Food Pavilion.

The exhibition's focus will be to present the latest developments and trends in the fields such as: • Processing Technology • Packaging Technology • Ingredients like aromas, enzymes, extracts, food preservatives, fruit products, powders, concentrates, starter cultures • Logistics / Production Transportation • Measuring and Regulation Systems • Analytics.

For more details contact:

Confederation of Indian Food Trade and Industry, Federation House, Tansen Marg, New Delhi 110 001. Tel: 011-3736305, 3738760 – 70 (11 lines), Fax: 011- 3320714 / 3721504, Email: ciftinfo@vsnl.net, Website: <http://www.foodtechindia.com>

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January 2002 (Issue)

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FOODPRO 2001

Venue: ITPO Trade Centre, Chennai
8th - 11th December, 2001

India's flagship & premier Food Business Event

India is already the World's second largest food producer with the potential to be the world leader. Food production is expected to double in the next 7 to 8 years and the consumption of value added foods are expected to treble from the current levels. The rapidly changing food habits has further opened up the market for processed and packaged foods. Large investments to the order of US\$ 40 billion in Technologies, Skills and Equipments are expected. This has opened up opportunities across the entire food chain for the integrated Growth and Development of the Food Industry.

Organised by Confederation of Indian Industry (CII) **FOODPRO 2001** will be held at the "New Exhibition Centre", the ITPO Trade Centre. It is a comprehensive business fair featuring a 4-Day International Exhibition and Conference on Food Industry, and will highlight and showcase the tremendous opportunities across the entire Agriculture, Food and Dairy Chain. Special feature of the event will be exclusive equipment showcase and live demonstrations of machinery and equipment.

FoodPro 2001 – The Highlights:
• 4-Day International Exhibition • Conferences and Investment Seminars • Technical Sessions and Technology Forums • Parallel Events and Food Festivals • Exclusive State Government Pavilion • 150+Exhibitors.

FoodPro 2001 – Opening Markets: Market opportunities across the entire Agri/Food chain by way of Investments, Joint Ventures, Technology Transfers with Indian Companies or Exporting to India • Modernisation of the Food Chain • Agri-Inputs (High Yielding Seeds, Processing Varieties) • Agriculture (Farming Techniques, Inputs, Basic Mechanism) • Procurement and Storage (Material Handling, Packaging, Cold Chains, Transportation, Grading Systems) • Processing (Large Scale Facilities, Processing and Packaging Machinery and Technologies) • Retailing (Cold Chains, Retail Outlets) • Exports of Food and Agricultural Products including Processed and Packaged Foods.

The **FoodPro 2001** Exhibition will attract all the players in the Agriculture, Food,

Dairy Businesses from all over India including Food Processors, Retail Chains, Hotel and Restaurants, Importers who would be using the Exhibition as a forum to source new Technologies, Equipments, Packaged and Processed Food and Dairy Products as well as fresh agro producers.

Exhibition Profile: Technologies, Equipments and Systems: Food Processing Equipment, Preservation Systems, Refrigeration Technology, Packaging Systems, Beverages, Processed Frozen Foods, Dairy Equipment and Technology, Dairy Products, Poultry Equipment and Technology, Poultry Products, Automation and Control Systems for Food Processing Equipments, Printing and Packaging, Storage and Handling Aseptic Facilities.

Food Products: Processed and Frozen Foods, Packaged Foods, Beverages – Tea, Coffee, Alcoholic and Non-Alcoholic Beverages. Dairy Products – Milk, Butter, Ice Cream, Cheese, etc., Horticulture Products.

FoodPro 2001 Conferences: CII will be organising a host of International Seminars and Conferences in areas such as bio-technology, water management, food processing, livestock, cold chain technologies, IT and agriculture, agri-infrastructure, agro-packaging, WTO and agriculture and food laws.

FoodPro 2001 Trade Visitors: ♦ Traders and Wholesalers of Food Products, Commodities, Fruits, Vegetables, Pulses, Grains, Farm Products ♦ Dealers and users of Food Processing and Packaging Equipments and Machinery. Users of storage equipments and Service providers ♦ Central Government Agencies ♦ Universities ♦ Research Institution and Colleges.

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The 4th Indian Food & Food Technology Fair.

Chennai
8th – 11th
December 2001

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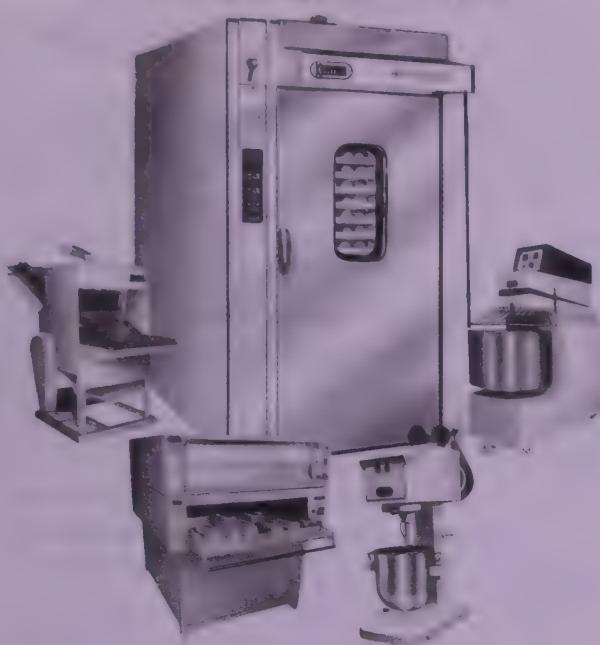
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The potential for development of Food Processing Industry in Karnataka is enormous. Karnataka is the first State in India to formulate an exclusive Industrial Promotion Policy for Agri Food Processing Industry more than two years ago, which is to be implemented to realise the dreams of providing millions of farmers in the State with better standard of living, marketing facilities for the farm produce and reasonable gainful prices for their produce. Keeping this in view, the State Government has initiated several measures and organised the **Bangalore Agri Food 2001**. Bangalore Agri Food 2001 is an Industrial Exhibition and Business Summit. This event will go a long way in creating Global awareness about Karnataka's potential in Agri Food Processing Industries and expose the entrepreneurs to the advanced technologies besides motivating foreign investors to make investments in the food processing sector.

Bangalore Agri Food 2001 will provide unique platform to technology producers and potential investors to forge industrial and business partnership on a sustainable basis. Natural resources, the vast reservoir of enlightened and skilled man power and proactive Government policies create a strong fundamental base for the growth of this industry in all its aspects. It is already a hub of international trade & commerce and has both the resilience as well as capacity to augment global trade in the food industry.

This Exhibition and Business Summit will show-case the strides that have been made in the high-tech agri-food industry and also provide information on the vast and almost unlimited scope for further development and growth in this field. **Bangalore Agri Food 2001** will help exploration of new business opportunities, establishment of new ventures, forging of partnerships in technology, infrastructure, finance and marketing by a unique and attractive display of innovative

products, techniques, technologies, plant and equipment of the industry from almost all the countries of the world which have made advancement in this field.

Thrust Areas: • Agricultural products particularly sugar, pulses, edible oils, agricultural technologies, inputs and equipment • Horticultural products specially fruits, vegetables, flowers and spices • Maize and corn products • Dairying and milk products • Poultry • Meat and meat products (both cattle and sheep) • Veterinary Sciences and Animal Husbandry • Fisheries and Seafood • Bakery and confectionary including chocolates • Beverages; tea, coffee and soft drinks • Wines, beers and liquors • Processing technologies and equipment • Packaging technologies and equipment • Biotechnology • Food Logistics - Warehousing, godowns, refrigerated transport, cold storages etc.

Participants Profiles:

Participants from MNCs, Government, Public and Private sector organisations, Research Institutions etc., engaged in the following segments will be displaying their products/services.

- * Food Processing Equipment Manufacturers
- * Food Preservation - Additives
- * Processed Food Packaging - Solids and Liquids
- * Horticulture, Floriculture and Aquaculture
- * Storage system of perishable products
- * Packaging Technologies
- * Seafood - processing and packaging
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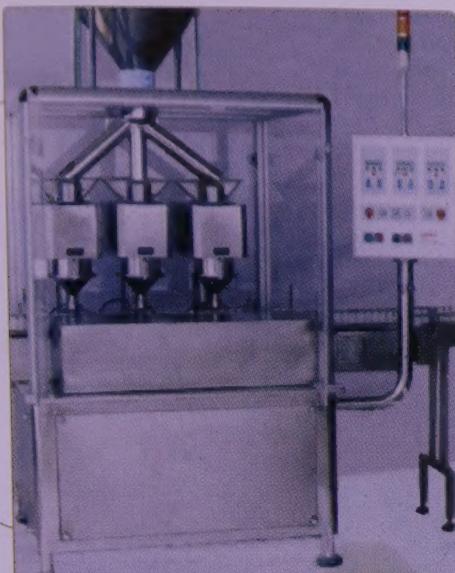
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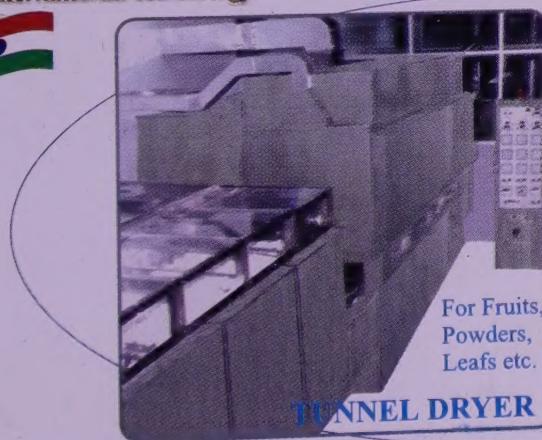


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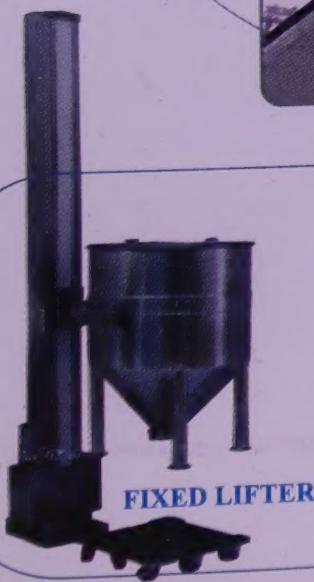
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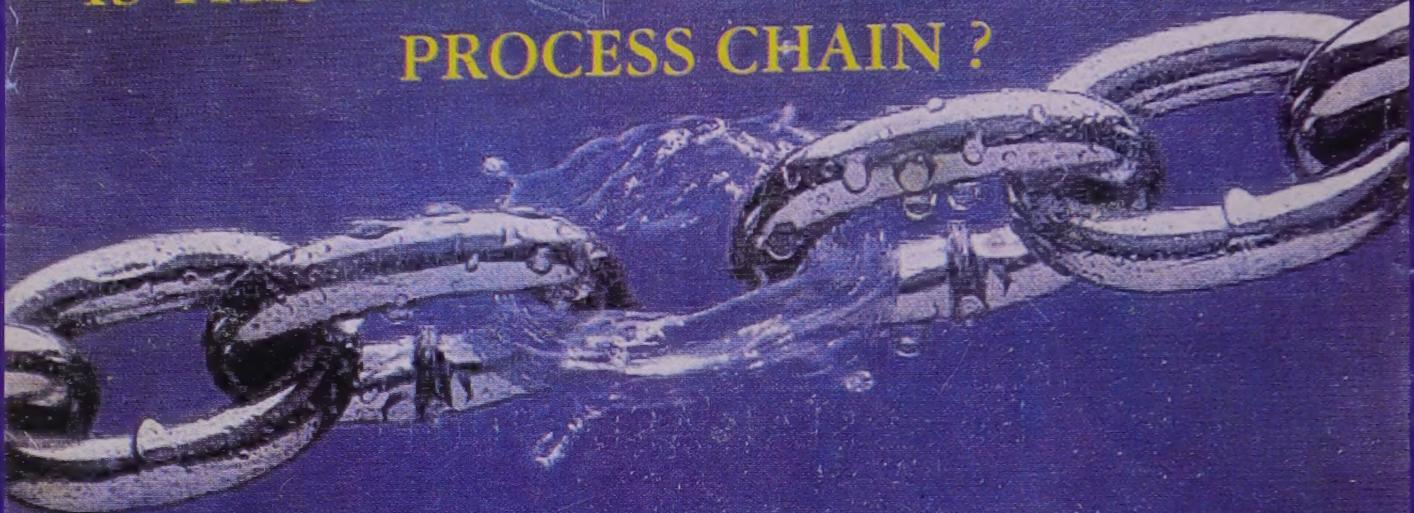
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